The Mining Journal

Established 1835 — Railway & Commercial Gazette

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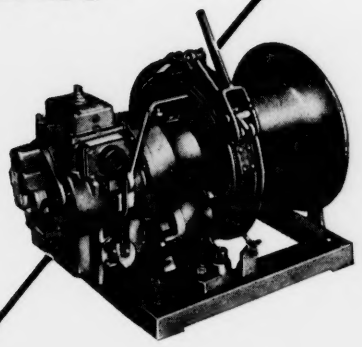

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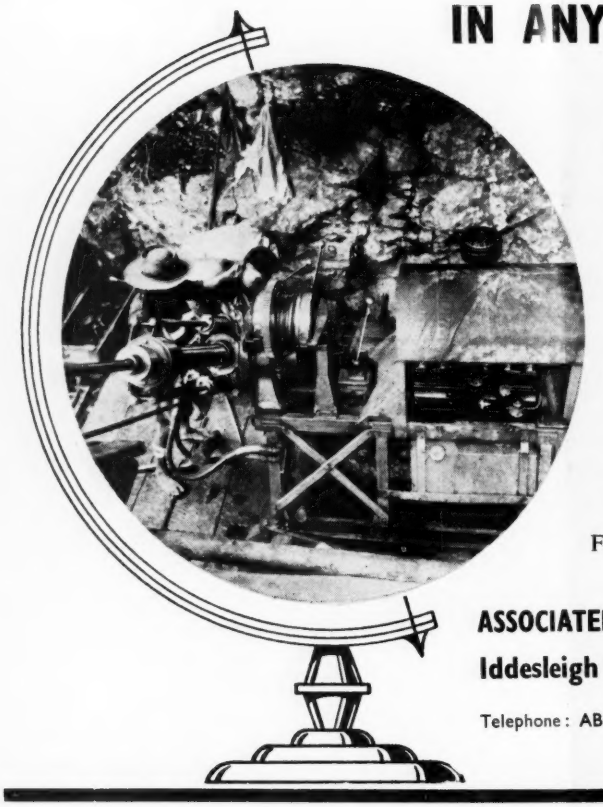

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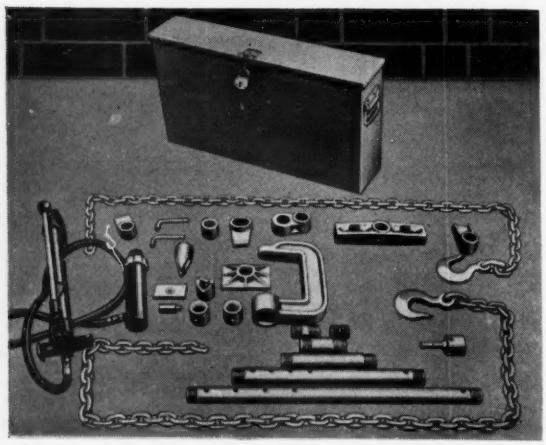

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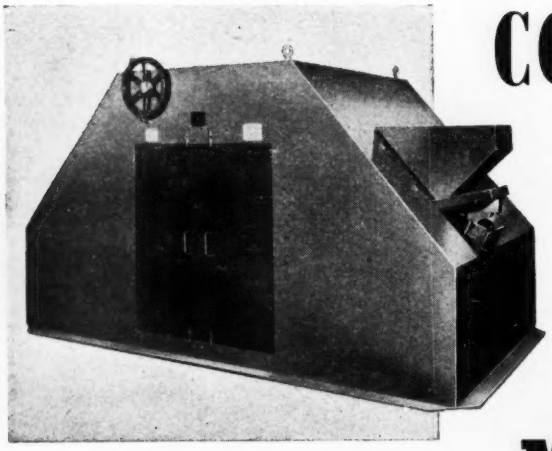

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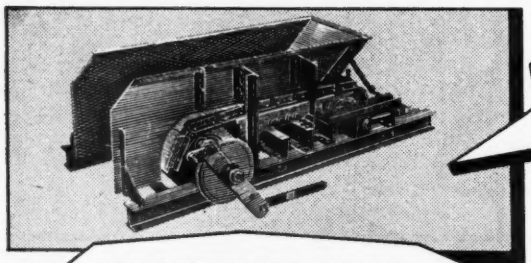

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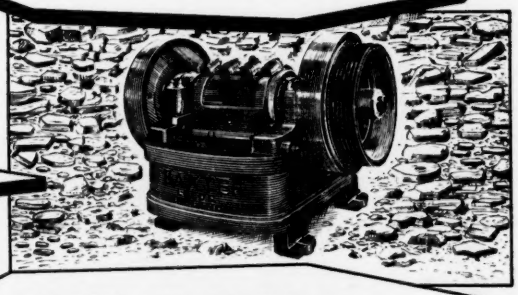

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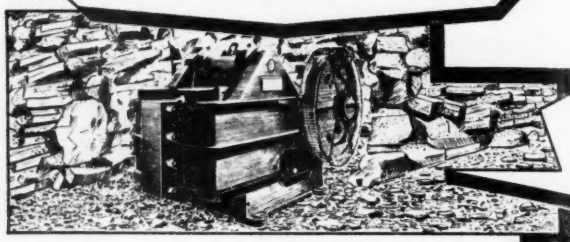

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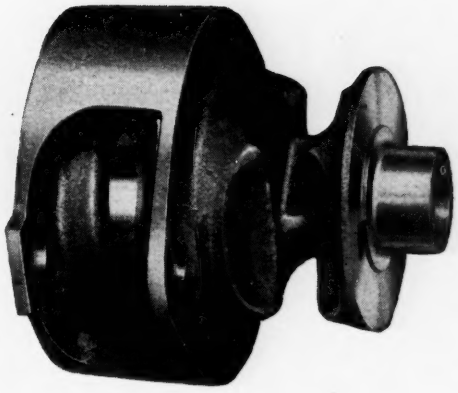

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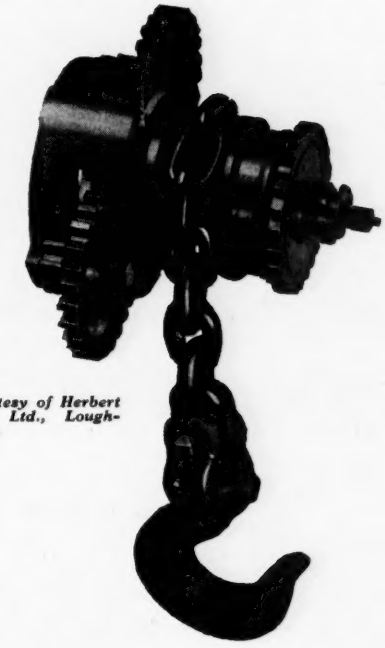

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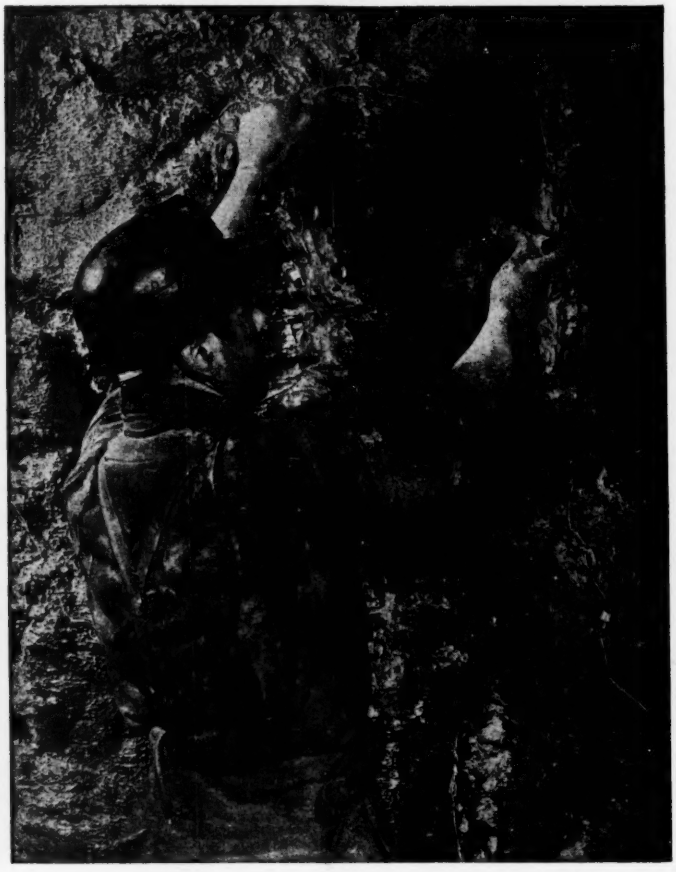

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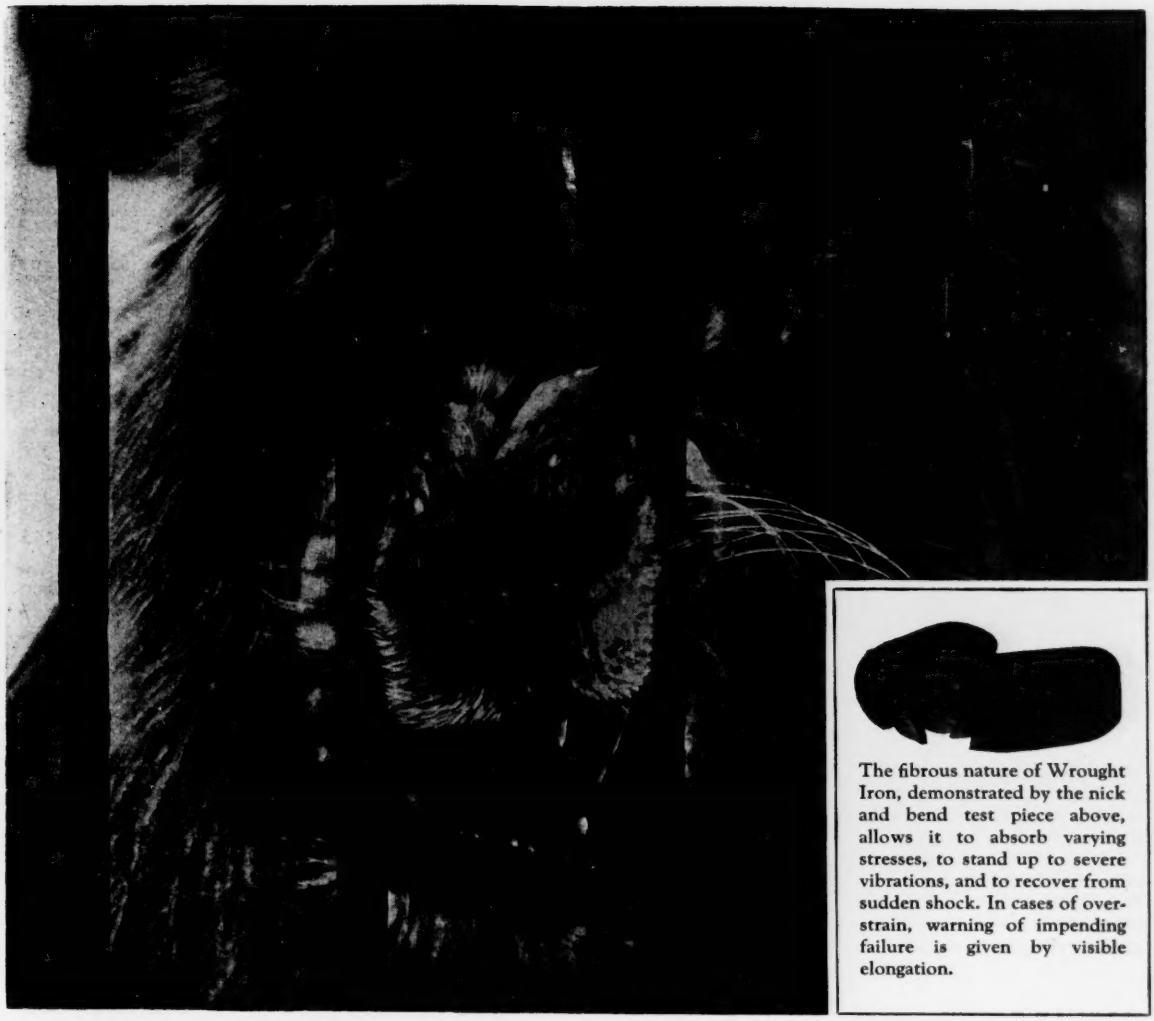

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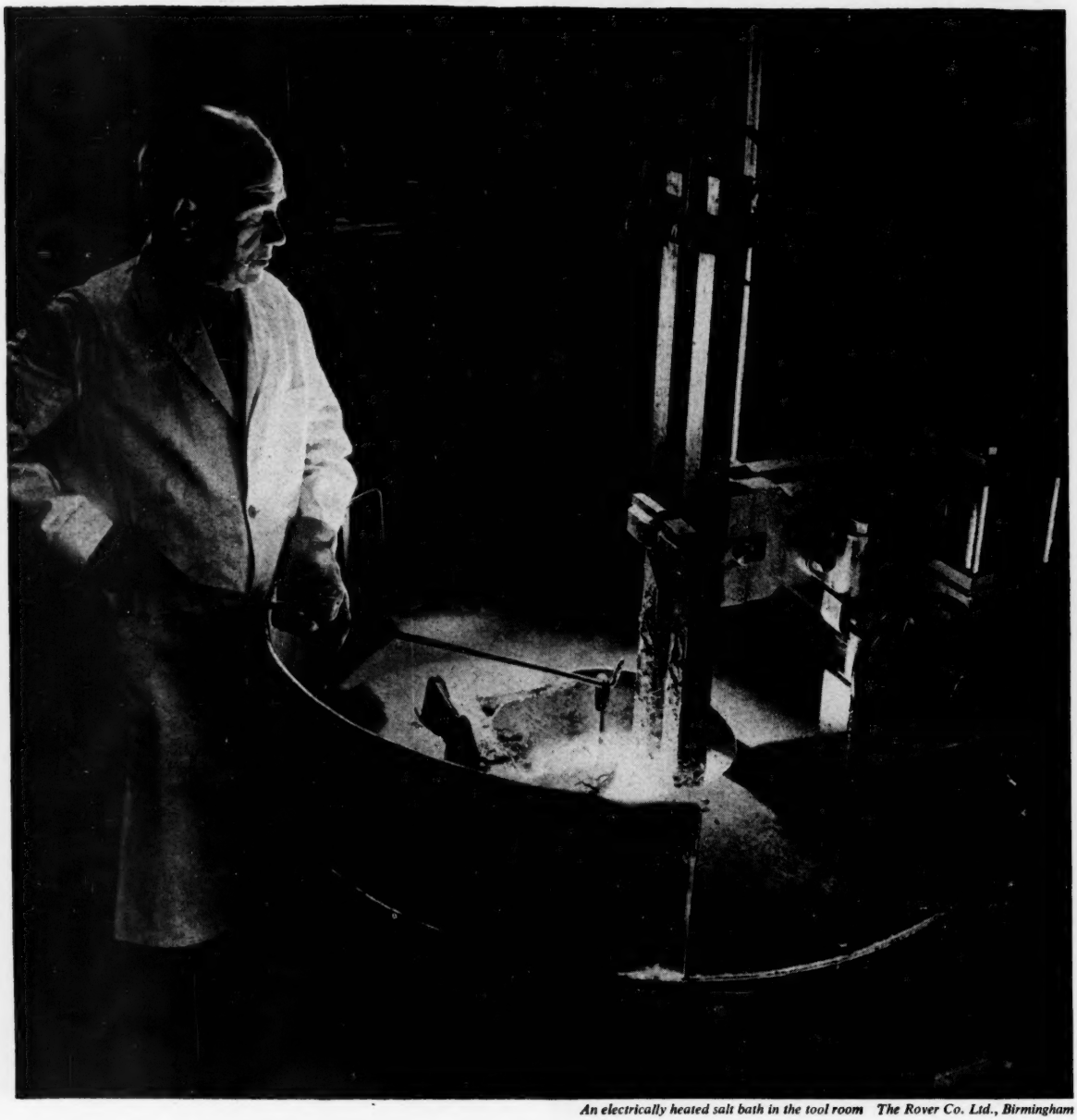

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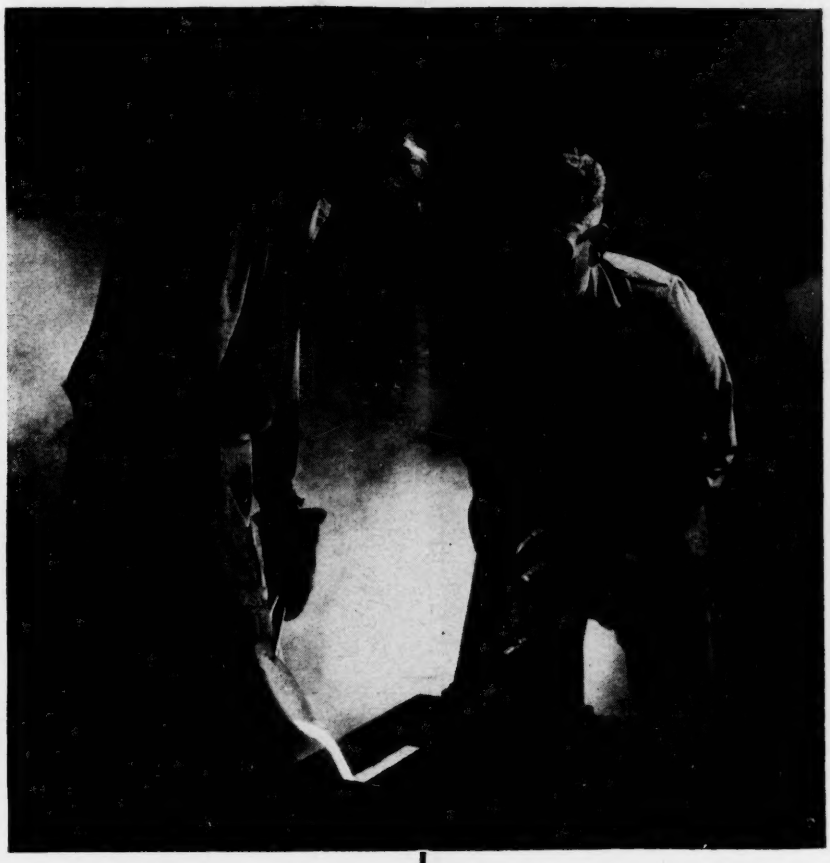

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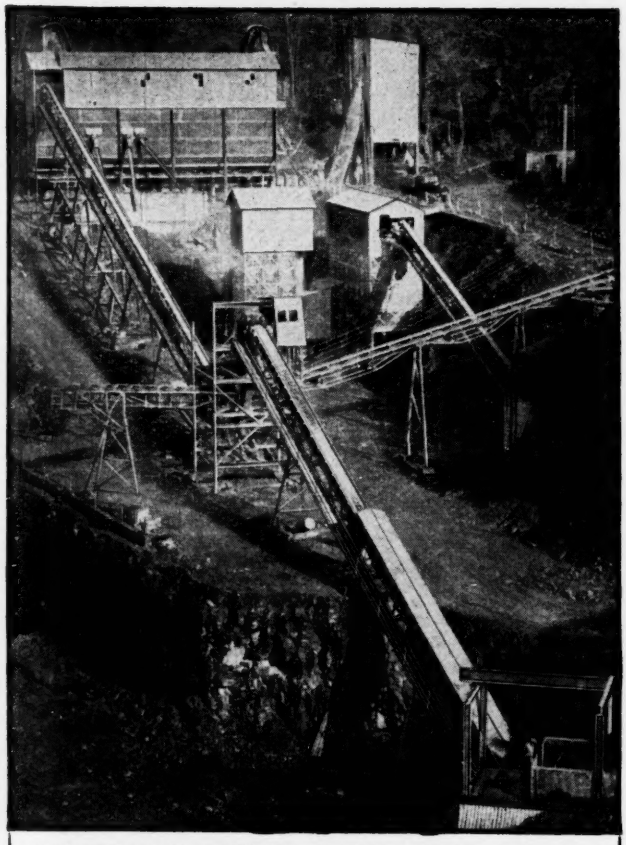

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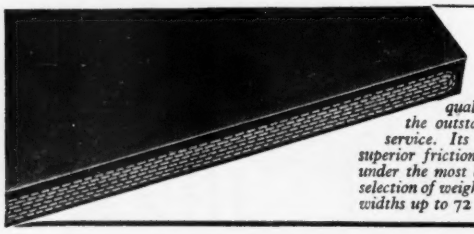

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The Mining Journal

Established 1835

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NOTES AND COMMENTS

Liberalizing International Trade

The importance to world trade in general and to the British Commonwealth of Nations in particular of a greater liberalization of United States foreign trade policy is almost a commonplace among economists on this side of the Atlantic. In Britain the slogan of "Export or bust" is accepted almost as an axiom but how to achieve a favourable climate in which intensified export trade can be obtained in another matter ; and it is obvious that without the co-operation of the United States, progress must be slow and precarious. To-day a larger part of the world's trade is being conducted in sterling than in any other currency. Yet confidence in this currency medium, without which the general mobilization of economic forces is severely and perhaps irresistibly restricted, can hardly be achieved unless there is a prospect of sterling convertability.

We have often had occasion to observe that historically and therefore, sentimentally, United States opinion has been driven to look for its trade internally just as Britain has been similarly led to look abroad. With the mutual positions of creditor and debtor nations reversed it is logical that the United States should adopt the liberal policy which served this country so well until we were impoverished by the tremendous strain of two great wars. Logical considerations, however, often take a long time to effect profound change in political and economic conceptions, but there can be no doubt that we are now approaching a critical position in the solution of the unbalance of international trade.

President Eisenhower has, on various occasions expressed his personal belief in the necessity of liberalizing United States policy in regard to international trade. But it has sometimes appeared as though he were fighting a losing battle with the entrenched forces of conservatism and vested interests. However he is a resolute as well as a skilful strategist and though his first round with the proponents of the maintenance or even increase of the United States tariff wall may have seemed to give him only a temporary respite through the extension of the Reciprocal Trade Agreements Act for one year, and though the importance of that portion of the Act which established a Foreign Economic Policy Commission may have seemed only a step to gain time, it has, perhaps escaped general notice that it may turn out to have been a subtle move by which the forces of opposition may be circumvented.

As early as last March the President invited Mr. Lewis Douglas, former U.S. ambassador to this country, to record his views on the question of trade and currency, particularly in their relation to sterling. Mr. Douglas submitted his report to the President on July 14, and the latter sent it with his strong approbation to the Commission on Foreign Economic Policy though delaying its publication until the composition of the Commission had been decided. With that point settled, the report was published at the beginning of this week.

Without going into detail, which would be impossible in the space at our disposal, it may be said that the report is a cogent presentation of the desirability, or, we might almost say necessity of economic and financial co-operation between the United States and the members of the British Commonwealth. Mr. Douglas is in a position to insist more strongly than any British statesman on the necessity for the United States removing from its policy the impediments to freeing trade and currencies, if it is to hope for a major increase in foreign markets, which its enormous productive potentialities demand.

A continuation of high protectionism would, Mr. Douglas points out, result in forcing the governments of countries, whose economy is struggling to maintain a precarious budgetary balance, to have recourse to import restrictions, controls, state planning and general discrimination against American products which would no doubt generally increase trade antagonisms on both sides. Thus, as world conditions stand at present, the United States would be condemned to an indefinite continuance of subventions and subsidies which opinion both there and in this country is equally unwilling to countenance. The aspiration of Great Britain has been expressed by Mr. Butler in the slogan "trade not aid" and American opinion seems equally to desire this even if at present it is not disposed to adopt the means.

As regards the measures leading to the convertability of sterling, Mr. Douglas suggests that it is essential to encourage the private investment of dollars in foreign countries assisted by the removal of hazards of double taxation and expropriation, and the formation of a combination of inter-Governmental agencies, private management, and capital, (more particularly between the International Bank and the Commonwealth Development Corporation) as an intermediate bridge between U.S. foreign aid and the period

when the flow of private capital is established on an adequate scale. The participation of American banking houses in sterling loans by London banks, coupled with a British guarantee of the rate of exchange and the underwriting by the Export-Import Bank of the transferability of pounds into dollars is also stressed.

Finally he recommends the adoption of measures to control the violent fluctuations in the prices and volume of the major raw materials which enter into international trade. Co-ordination between governments, he considers, should be developed so that buying by public agencies could be diminished when the business community is building up inventories and increased when it is not, so as to mitigate the effect of cyclical movements in such commodities.

Up to World War II, American industry may not unfairly be said to have regarded exports largely as a means of syphoning off surplus domestic production. Now that the United States is no longer self-sufficient for most of her raw material requirements, and seems destined in the future to become increasingly dependent on mineral imports to feed her industries, this picture must inevitably change, and compensating exports will become an economic necessity.

Such a necessity may perhaps appear to some Americans to be so remote at present as to be outside the scope of practical considerations. It may, therefore, be worthwhile recalling some of the broad conclusions of the Paley Report in this context. Pointing out that over two-thirds of the 100 minerals employed in American industry were now imported either wholely or in part, the report rejected completely the concept of U.S. self-sufficiency as amounting to nothing more than a self-imposed blockade and described as fallacious and dangerous the agreements put forward for restriction of imports on the grounds of protecting the American standard of living from the competition of lower paid foreign labour. Characterizing such views as the product of an unemployment psychology, the report maintained that under conditions of full employment, the supply of any material from abroad at a price below that of domestic costs actually helped to raise the U.S. standard of living.

The Paley Report was a product of the Truman Administration and on these grounds alone no doubt stands discredited in Washington to-day. It is therefore of considerable significance to find Mr. Douglas' report, prepared at the behest of President Eisenhower, expressing very similar remedies to those put forward in the Paley Report for the stimulation of foreign trade and the opening up of new free world resources.

What effect this may have on the minds and conclusions of the Foreign Economic Policy Commission we shall have to wait till next year to learn, but if they prove broadly acceptable, producers of raw materials, more particularly tin, will probably be encouraged to hope that the willingness of the United States once more to enter on restriction and buffer pool discussions may have a more favourable outcome than has seemed likely to be the case.

In seeking to form an opinion as to whether the liberalizing policy which President Eisenhower personally favours will prove victorious, the militancy of the Protectionist camp and particularly of Senator McCarthy cannot be overlooked. Senator McCarthy appears to be seeking to raise the West on the issue that President Truman and the Democrats have wellnigh ruined the domestic mining industry and forced the nation to be dependent on foreign supplies, and those who recall Mr. William J. Bryan's fiery appeal " not to allow the nation to be crucified on a cross of gold " may find it difficult to judge the success that a similar political appeal might achieve, if made to-day. But in the present instance the President could, no doubt, count on a considerable measure of support from the Democratic Party in Congress especially when it is remembered that President Eisenhower's victory at the last election was generally conceded to be due largely to his own personality and that without the popular favour thus accorded to him the Republicans would probably have failed to win the election.

U.K. Mines Inspectorate Reports for 1951

The Report of the Chief Inspector of Mines in the U.K. on workings under the Coal Mines Act for the year 1951 was published recently. In it we are promised the Report under the Metalliferous Mines Regulations and the Quarry Acts but this has still to appear. It is unfortunate that Reports should have to be published so long after events with which they deal.

It is impossible, with the space at our disposal, to notice all the many particulars noted by the Chief Inspector. Three principal features seem outstanding. On the economic side there is a steady increase in the amount of explosives used, and of the proceeds in terms of coal produced. In 1940, the earliest year recorded in this Report, every pound of explosives used gave 7.11 tons of coal and this figure has diminshed yearly to 4.28 tons in 1951. This result is emphasized by the improvement made in explosives manufacture in the 12 year period. Two causes no doubt contributed to this deterioration—the necessity of mining narrower seams, to which reduction in development operations especially during the war probably contributed, and the possible deterioration in experience and skill of shot-firers. Regarding this latter point the Report concludes that more shots are being fired than is necessary and that too many are over-charged.

The second question inviting attention is explosions underground. Both in 1950 and 1951 there were serious disasters resulting from coal dust explosions—Creswell in 1950 and Easington in 1951. In 1951, 97 persons were killed in three explosions, 81 of these lost their lives at Easington Colliery, where an explosion of fire damp initiated a coal dust explosion, in which everyone working in the district was killed. In the other two cases, where no coal dust explosion followed, the fatalities were small. It will thus be seen that coal dust explosions remain a serious risk to coal winning operations in this country. Underground explosions in 1948 killed 17, and in 1949 only 9. When dusting of the roads with an application of inert stone was first introduced it was hoped that disasters from this cause would be obviated in the future, but this hope clearly has not been fully realized. It is often impossible after a major explosion to determine how and where the original ignition in the atmosphere occurred, but the Chief Inspector mentions several cases where illegal smoking appears the most probable explanation. Other instances of carelessness are mentioned as, for instance, hanging clothes around a flame safety lamp, where, fortunately, coal dust was not ignited. As regards ignition of fire damp, the Report stresses the importance of observation of barometric pressure, which if suddenly reduced may result in fire damp and irrespirable gasses being emitted.

The third point which seems to call for notice in the Report is the health danger due to the inhalation of dust—pneumoconiosis. During 1950 and 1951, 6,782 miners were diagnosed by the Pneumoconiosis Medical Board as affected by this complaint, though about half the men were allowed to continue working in the mines. The Report concludes that much remains to be learned regarding initiation and progression of pneumoconiosis amongst coalminers, and the National Pneumoconiosis Board has set up a subcommittee to direct field research. Naturally, coal dusting tends to increase the amount of particulate matter in the mine atmosphere. Extensive watering, equally, has its drawbacks in humidifying high temperature workings and creating favourable conditions for the development of ankylostomiasis. We do not hear much these days of treatment with deliquescent materials.

The Implication of Canadian Switching Facilities

The Treasury permission to switch Canadian dollar securities in Canada into either similar stocks or U.S. dollar stocks is a step forward to the freedom of exchange and stock markets.

After the war, buyers of Canadian securities had to purchase their stocks in a limited London market consisting of the few securities which remained in England. This caused big premium prices on the more popular issues. Later on, it was possible with the aid of "D marks" to buy in the U.S. market both U.S. and Canadian securities, but in this case it was necessary to pay both premium and cost.

Although switching in U.S. securities has been allowed for some considerable time, any sales of Canadian stocks in Canada meant that the dollar proceeds were, by law, surrendered to the Treasury. In practice, this was not often done partly owing to the big premiums obtainable in London and also to the reluctance of dealers to narrow still further the limited London market in these securities. The switching which could be carried out on Wall Street was rarely satisfactory so far as Canadian stocks were concerned, except of course in the case of Internationals. Many Canadian securities command only a limited market in the U.S.

The first effect of the new regulations was to consolidate the premiums on the Canadian dollar securities in London. Prior to the announcement, these premiums varied between 6 per cent on the more popular stocks to nil on those which were calculated to be on the wane. Now, all stand at 4 per cent premium which is worked out from the nominal exchange basis of $2.80 to the £ sterling.

Here, perhaps, an explanation of London's "dummy dollar" would not be out of place. Prices of Canadian and U.S. securities are still calculated at the nominal rate of $5 to the £ and in this quotation dealers iron out the minor adjustments which are necessary in calculating a price in London. Although this practice has considerable advantages in simplying dealing it is often very confusing to the uninitiated investor who frequently imagines that he is paying in London nearly twice as many dollars as he would in Montreal. Attempts to explain this system to their clients have turned many brokers' hair prematurely grey.

The advent of the 4 per cent premium following the freeing of switching, caused several sharp adjustments in price. Those shares which had higher premiums fell back and those which had none had temporary sharp rises.

The main immediate results have been the ability to deal in any reasonable amount of stock without paying fancy prices, and the narrowing of quotations in securities where previously there had been a very limited market. It is also possible to purchase more obscure securities by switching in Canada.

In the market itself, there was no substantial increase in the volume of business but considerably more inquiry. It should now be possible to carry out calculated readjustments to large portfolios which had been held in this country since 1942.

It is probable that the comparatively small increase in turnover has been affected by several other factors. Transatlantic markets have recently shown an easier tendency and there has been talk of a U.S. trade recession in 1954. To-day the £ is no longer quite so vulnerable as it was two or three years ago, and investors may be undecided whether it is best to hold sterling or dollars. North American markets have always been more volatile than London and if there is any chance of a fall in share prices, investors may well keep out of the market for the time being. The vast potentialities of Canada, however, can be expected to check this downwards trend sooner or later except, perhaps, in the more vulnerable securities.

In the long run, the new regulations can only bring about more healthy market conditions and it is to be hoped that they will ultimately lead the way to a completely free exchange between the dollar and sterling areas. Such a move should do away with many regulations and induce increased international trade and truly competitive commerce.

Outlook for Some Leading Canadian Shares

Although switching facilities are now available, it remains difficult to give any general picture of the outlook. Due to lack of space, it is only possible to mention some of the more popular counters on the London market. One of the foremost is International Nickel. The keynote of this company has been its rapid expansion during and after the war and indeed to-day it is one of the principal suppliers of nickel to the free world. The company has recently completed the initial stages of a large underground development scheme and production from this source is rapidly expanding as its opencast workings close down. In addition, new ore bearing areas have been discovered. It will be very interesting to see how the future market for nickel develops. The late war, and subsequently the cold war, have kept up the high level of demand, but it is not certain how much industry will require in the event of scaling down or completion of rearmament programmes. To-day the stock gives a yield of over 6½ per cent giving a clear market assessment of the potential risks.

Again, such lead/zinc producers as Mining Corporation of Canada and Hudson Bay Mining return very high yields. The outlook for these metals is obscure and, in these two particular companies, the margin between earnings and dividends is small. Mining Corporation last year earned $1.50 per share and paid $1; the current yield is around 9 per cent. Hudson Bay Mining earned $5.37 and paid $5 and returns a yield of nearly 10¼ per cent. The yield on Consolidated Mining and Smelting is also on the high side at nearly 6 per cent. The company also produces silver and is one of the largest concerns of its kind in the world. Noranda has very large copper interests and some gold production as well. The earnings margin here is wider at $5.45 per share against a total dividend of $4; the yield at around 5½ per cent probably denotes the better statistical position of copper, but here again the uncertain outlook for the metal may encourage caution among investors.

Against the high yields obtainable on base metal shares, gold producers such as Dome are on a much lower basis. The return obtainable on this share is only about 3¼ per cent despite the difficult times which North American gold mines are suffering. It may be the belief that the dollar is over-valued against gold and that some action will ultimately have to be taken by the U.S. which causes a steadiness in this type of stock. This particular share was a very restricted market in London before the switching regulations.

One of the most interesting and popular shares dealt in London is Hollinger. The yield here is only 1½ per cent despite the difficult times which the company's gold interests have gone through. This concern recently acquired a large interest in the Labrador Iron and Seven Islands project. This is now developing, and the completion of the St. Lawrence seaway may well mean that the Labrador field will in future supply much of the raw material for the Pittsburgh and Canadian steel industries by water.

A small and much more speculative stock that has recently been a popular counter is Rix Athabasca. The company was formed to develop a uranium project and is one of the few solely uranium mines which are dealt in on the London Exchange. As this concern is in the development stage, it is far too early to pass any judgment upon it but, like all other securities, it must benefit from the new switching regulations as only a limited number of shares was brought to England when the company was floated.

Canada

(From Our Own Correspondent)

Timmins, August 10.

The slump continues in the gold-bearing areas of Canada. Output for the first half of 1953 was $42,220,000 from 4,866,000 tons of ore from an aggregate of 39 mines. This compared with an output of $43,340,000 from 5,178,000 tons from 42 mines in the corresponding period of the preceding year. It is not alone in the decline in the number of producing mines that uneasiness prevails. Of even greater concern for the future is the absence of prospectors in the newer areas. Prospectors are finding it difficult if not impossible to secure grubstakes under which to hunt for gold-bearing deposits, and capital is reluctant to participate in the gamble of developing new gold mines. Nothing short of a substantial increase in the price of gold is likely to encourage a resumption of activity in the large and unexplored auriferous areas of Canada.

Demands of labour unions in the gold mining areas, more particularly in the Porcupine goldfield of Northern Ontario, has posed a serious threat to the welfare of a number of producing mines. Shareholders of operating companies are openly advocating a suspension of operations in some instances. Operating profits are already perilously small, and many stockholders believe it would be the better part of wisdom to forego production unless or until costs of production decline or the price of gold rises.

NICKEL NEWS

One more nickel producing enterprise has been established in Canada. This time it is the Nickel Offsets Mine—and once again the locality is the Sudbury district of Northern Ontario. The new mine begins on a modest csale with a concentrator of 300 tons daily capacity. Disposal of the production is covered in a contract with Falconbridge Nickel under the terms of which 10,000,000 lb. of recoverable nickel is contracted for at a rate of approximately 3,000,000 lb. per year. Albert Wende and associates of Buffalo, N.Y., identified with Wright-Hargreaves and Lake Shore Mines of Kirkland Lake, have been responsible for the financing and development of the new Nickel Offsets Mine at Sudbury.

Falconbridge Nickel Mines, with production rate already raised to 30,000,000 lb. annually, is already engaged in expansion designed to increase to 45,000,000 lb. Enlargement beyond that stage will involve still more serious planning. The outlook is that resources available may ultimately justify an output of 60,000,000 lb. of nickel annually. In that event, the question of a nickel refinery in Canada would be probable, involving the outlay of a vast amount of capital.

Meanwhile, International Nickel, the world's chief source of nickel, continues far out in front of all other nickel producing projects. This company has ore reserves of some 250,000,000 tons. Current ore consumption is around 1,000,000 tons a month. The company is employing over 70 diamond drill rigs in its search for additional orebodies. A large staff carries on continuous research and is steadily adding to new uses for the metal. The 70 diamond drill rigs referred to are engaged in exploration alone, and are in addition to those employed at the producing mines.

CANADIAN ASBESTOS MANUFACTURE

Opinion is becoming increasingly widespread that ways and means should be developed to manufacture more of the asbestos output of Canadian mines into finished products. At the present time, Canada is exporting about $5,000,000 per month of asbestos fibre to the United States, a rate of $60,000,000 a year. At the same time it is estimated this fibre is manufactured into finished products in the United States at the rate of more than $35,000,000 per month—or about $430,000,000 a year. Of total annual output of close to $82,000,000 in asbestos fibre produced from Canadian mines, less than $2,000,000 is exported in the form of manufactured product. Canada actually imports more than $3,000,000 a year in finished asbestos products.

Rankin Inlet Nickel Mines Co. has a small cargo ship on its way from Montreal to the north-western shore of Hudsons Bay. The ship contains some 2,000 tons of material, equipment and supplies valued at about $400,000. As soon as the equipment can be installed, shaft sinking will begin, and will represent the more northerly point at which serious base metal mining has so far been attempted in Canada.

EXPANSION OF STEEP ROCK

Steep Rock Iron Mines in north-western Ontario is increasing production steadily this year. With the ore now commanding a price of $10 per ton, the objective for the coming year is an output minimum of $20,000,000. Meanwhile, the general plan of development is pointing toward production of well over 3,000,000 tons by 1954, or gross annual output of $30,000,000. Study is being given to the situation beyond 1954, with the thought in mind that the indicated resources may justify ultimate expansion to over 5,000,000 tons annually for gross yield of upwards of $50,000,000 a year.

Portugal

(From Our Own Correspondent)

Oporto, August 17.

With the June export figures now available it is possible to compare the totals for the first half of the current year with those of the same period of 1952. The following table gives this comparison in tonnes :

	1953	1952
WO_3	1,476	2,394
Tin Concentrates	827	791
Tin Metal	25¾	121
Cupreous Pyrites	139,750	181,399
Roasted and Leached Pyrites ..	118,599	146,475
Manganese Ore	8,524	1,987
White Arsenic	694¾	543½
Haematite	56,902	—

Additional to the above, there have been some small shipments of beryl and tantalite/columbite.

The most outstanding difference between the two periods will be seen to be the fall in the exports of wolfram ores ; 904 tonnes over six months is a large total in terms of to-day's price both for the State in the way of duties, as well as for the mine owner. Shipments to the U.K. are practically limited to the output of a single group of mines and confirm your correspondent's earlier remarks about the loss of the traditional markets. Whether putting all the eggs in one basket will turn out to be good or bad policy the future will show.

The small increase in the exports in tin concentrates, in your correspondent's opinion, is due entirely to the fact that currency shortage obliged holders of stocks to sell. Old R.F.C. contracts are now almost worked off and no fresh obligations appear to be undertaken.

A minor demand has recently been expressed for high-grade scheelite and off-grade tinny scheelite. Some interest in wolframite has been noted on the U.S.A., but the spark is not general being limited to a few firms.

Selenium — A Scarce By-Product Metal

Though most raw materials have become more plentiful, selenium remains critically scarce. Because of its unique properties this metal has become extremely important to industry and defence and demand has outstripped supply. The authors of the Paley Report stated that selenium stocks were at their lowest level since this metal was first refined on a commercial scale and that one of the largest users, the glass industry, was receiving only about 15 per cent of its needs. Though there is some production in other countries the bulk of the world output comes from the United States and Canada, which together supply about 1,000,000 lb. per year. The relationship between supply and demand is complicated by the fact that selenium is essentially a by-product metal, which is recovered mainly from some of the anode sludge left in electrolytically refining copper.

Native selenium occurs in association with native sulphur and metallic sulphides and the element is also a constituent of many minerals. Among the latter are aguilarite (silver sulphide selenium), berzelianite (copper selenide), clausthalite (lead selenide), crooksite (copper thallium silver selenide), eucairite (copper silver selenide), guanajuatite (bismuth selenide), neumannite (silver selenide), and tiemannite (mercury selenide). Neither native selenium nor the selenium minerals occur in sufficient quantities to be commercial sources of the metal, but small quantities of the element are present in some pyritic ores and may be recovered from sulphuric acid plants which burn pyrites.

The element forms several allotropes, the ordinary one being a greyish metal with a semi-metallic lustre, which is crystalline and has a specific gravity of 4.47. A red amorphous form, which is the only one of metallurgical interest, possesses the remarkable property that its electrical conductivity varies according to the intensity of the light falling on it. Selenium has an atomic weight of 78.96, melts at 217 deg. C. and boils at 690 deg. C., giving off dark red vapours. In a high vacuum it boils at 310 deg. C. It has six natural isotopes and artificial isotopes have been prepared by nuclear reactions. Pure selenium is stable in air and resists oxidation at ordinary temperatures. In general, its chemical and physical properties resemble those of sulphur.

PRINCIPAL USES

Until some 20 years ago selenium was regarded as a scientific curiosity, but in recent years many important uses have been developed. The biggest field of applications is for colouring and decolouring glass. Many tons are used annually in the manufacture of red signal glass, red glass for motor car tail lamps, and other coloured glassware.

The well-known application of selenium in the construction of photo-electric cells is based on the fact that the electrical resistance of the metal varies proportionately with the intensity of the light falling on it. One of the most important fields of usage is in the manufacture of metal plate rectifiers, which are used for many applications in industry and in communication systems. In battery charging the rectifier reduces the current automatically as the battery voltage is increased and prevents battery discharge through the rectifier when the alternating current fails. Among the highly specialized applications for which rectifiers containing selenium are suitable are magnetic clutches, solenoid valves, alarm signals, etc.

In the rubber industry selenium is used as a secondary vulcanizing agent to increase resistance to heat, oxidation and abrasion, and to increase resiliency. Small quantities are added to stainless steels and copper-rich alloys to improve machineability and to magnesium-manganese alloys to increase corrosion resistance. A protective layer of selenium may be applied to magnesium alloys used for aircraft construction. The parts are immersed for a few minutes in a 10 per cent solution of selenious acid containing a little sodium chloride. This produces a film of selenium which is very resistant to the corrosive action of sea water and forms a satisfactory base for certain types of paint. Since the problem of providing adequate protection against corrosion is one of the principal factors limiting the structural uses of magnesium, the interest which is being taken in selenium from this point of view seems to indicate the possible development of a new and very important field of applications.

OTHER APPLICATIONS

There are many other actual or potential uses. Selenium has been employed on a small scale for fire-proofing fabrics, wood and other materials. Wires insulating electrical cables can be coated with selenium, or the cotton and rubber covering can be impregnated with this material. A cable which has been so treated will not continue to burn when removed from a flame and will not catch fire as a result of a short circuit. A number of pigments containing selenium have been developed, some of which may become commercially important. Selenium may be used in place of sulphur as a catalyst for fat hardening, while the metal selenidies act as hydrogenation and cracking catlysts for the conversion of heavy oils to motor fuels. As an insecticide, selenium is used for controlling insect pests in citrus fruits, grapes and ornamental plants.

According to the Paley Report many new applications which have been developed are now dormant because of a very great increase in the cost of the metal since the original work was initiated. Many of these uses are only awaiting the time when economic factors are suitable for their development. In the electrical field there appear to be no substitutes on the horizon which can replace selenium, although some may be developed from other photosensitive and semi-conductor materials. In the glass industry alternative materials are found, but most of them have undesirable characteristics. The Paley Report predicts that the consumption of selenium will continue to increase a contributory factor being the advent of television, which has led to an increased demand from the electrical industry.

EARLY RECOVERY PROCESSES

The first commercial source of selenium was the mud deposited on the lead chambers of sulphuric acid plants burning Scandinavian pyrites and the copper ores of Mansfield, Germany. Some selenium is still extracted from acid chamber mud, from the crude acid itself, or during the purification of the sulphurous gases in the contact process. In roasting pyrites the selenium is oxidized to selenium dioxide, which is then reduced by the sulphur dioxide in the lead chambers to finely divided selenium, which is deposited as a red sludge.

Originally the selenium was recovered from the sludge by a dry roasting process, but the losses were considerable and the final product had a lead content of about 0.5 per cent, which rendered it unsuitable for use in photoelectric cells. This method has therefore been superseded by a wet purification process. There are three alternative methods of oxidation, based respectively on potassium permanganate, sodium or potassium chlorate, and oleum containing 20 per cent of sulphur trioxide. The oleum process is claimed to be the cheapest and most suitable. In each case selenium is dissolved while the lead and other impurities remain insoluble and are removed. Selenium is then precipitated by sulphur dioxide and is finally purified by distillation in a

cast iron still containing 5-6 per cent silicon. The final product is usually 99.5 per cent pure and contains traces of iron and sulphur.

GROWTH OF PRODUCTION

The first experiments in the recovery of selenium by American copper refiners started about 1905, when commercial demand was very limited. By 1910 the U.S. output had risen to some 10,000 lb. annually. In 1943, it reached a war-time peak of 635,581 lb. and in the same year Canada produced 374,013 lb. In 1946, the corresponding figures were 291,103 lb. for the U.S. and 521,867 lb. for Canada. Canadian production dates from 1931, when the Ontario Refining Co. Ltd. started to recover selenium at Copper Cliff, Ontario. Canadian Copper Refineries Ltd. began production in November, 1934, from residues that had accumulated at Montreal East, Quebec. Northern Rhodesia has an output of some 12,000 lb. annually.

Australia produces about two tons of elemental selenium per year, but the domestic demand is now much greater than the local output. Anode sludge containing selenium is obtained by the Electrolytic Refining and Smelting Co. at Port Kembla, and by the Mount Lyell Mining and Railway Co. at Queenstown. The sludges from the two companies contain 1-2 per cent and 2 per cent selenium respectively. That from Mount Lyell is sent to Port Kembla for refining.

PYROMETALLURGICAL PROCESSES

In the usual pyrometallurgical process for treating copper ores, selenium and tellurium are concentrated in the blister copper in the form of selenides and tellurides of copper, gold and silver. Extraction is complicated by the simultaneous production of pure copper, selenium, tellurium, gold and silver. The composition of blister copper varies considerably. Montana blister is low in selenium but has about 0.10 per cent tellurium, that from Arizona has about 0.15 per cent selenium, while the coppers of Eastern Canada contain as much as 0.26 per cent of total selenium and tellurium. An analysis of blister copper from Mount Morgan, Australia, gave 0.19 per cent selenium, while the converter flue dust has been found to contain this element to the extent of 0.04 per cent.

Some slimes from the refining of eastern Canadian copper contain about 24 per cent selenium and nearly 4 per cent tellurium, but these are exceptionally rich, slimes containing as little as 5 or 6 per cent of either metal being quite common. The anode slimes are roasted and then leached with dilute acid to recover their small copper contents. Some selenium and tellurium dissolve with the copper and the solution is therefore purified by boiling with metallic copper, the resultant slime containing copper selenide and telluride. The purified solution is returned to the electrolytic cells, while the slime is returned to the residue from leaching, which is then treated in the Doré furnace to recover the gold and silver content.

Most of the selenium is volatilized in the furnace and it is subsequently collected in the dust and sludges from the flues, water scrubbers and Cottrell precipitators. The flue dust and sludges are roasted in a special furnace at a low temperature. This oxidizes the metallic selenium to selenium dioxide, which is collected in the cooler portions of the flue in the form of impure crystals known as "selenium whiskers." These are dissolved in water, filtered, and precipitated as selenium in the red amorphous form by means of sulphur dioxide gas. The remaining selenium and tellurium in the Doré furnace charge are removed by fluxing with soda ash or caustic soda and sodium nitrate. The soda compounds are leached out of the slag with water, giving a strongly alkaline solution of sodium, selenite and tellurite. The latter is removed by precipitation as tellurium dioxide on the neutralization of this solution with crude sulphuric acid. The selenium remaining in solution is recovered and mixed with that from the flue dust. It is converted to the black modification in which form it may be sold. If sticks or cakes are required, the black amorphous powder is melted under a sodium nitrate flux in cast iron pots, from which it is cast in the vitreous modification. Sodium selenite, selenious acid and selenium dioxide are also commercial products.

Because of the unique properties of selenium great importance is attached to the development of improved supplies. The authors of the Paley Report put forward five possibilities which are regarded as well worth consideration.

SCOPE FOR IMPROVED SUPPLY

The first recommendation is the recovery of selenium from smelting operations in plants which are not now equipped to refine the material. An example is cited of a company which does not recover the selenium from 3,000 tons of ore which are processed per day but are not electrolytically refined.

Secondly, it is considered that better recovery in plants now producing selenium could undoubtedly be obtained. It has been reliably reported that one of the largest producers in North America is obtaining only about one-third of the selenium present in the ores. The remaining two-thirds is lost during the smelting operations because of the inherent characteristics of the operation. It is estimated that by modification of existing equipment and processes this one company alone could increase its output of selenium by about 300,000 lb. per year.

A third possibility is the recovery of the selenium and tellurium contents of sulphur produced by roasting pyrites. If this could be achieved a considerable increase in the production capacity of selenium would be realized, but at present there is no known means of recovering the selenium from the sulphur economically.

Newly developed copper deposits in the West are expected to be in production in the near future, and it is considered quite probable that these copper ores will be found to contain some selenium.

SELENIUM "FARMING"

The last—and in some respects the most interesting—suggestion in the Paley Report is the possibility of selenium "farming." It is well-known that many areas in the West—especially in the Dakotas—have seleniferous soils. Plants grown on these soils absorb selenium to such an extent that animals grazing suffer to a considerable extent from selenium poisoning. The proposal is that crops of suitable type should be grown and harvested and that they should then be processed to extract the absorbed selenium. Some plants average 800 parts per 1,000,000 of selenium with up to 15,000 p.p.m. or 1.5 per cent selenium present as a maximum. It is calculated that by special selection of those plants that are best at accumulating selenium, on a yield of 1 to 2 tons per acre some 20 to 40 lb. of selenium could probably be obtained in an ash concentrate. This possibility is regarded as reasonably economic.

Since no copper sulphide ores are found in Britain supplies of selenium for U.K. consumption must be imported. Nevertheless the Metals Economy Advisory Committee in a report published last year refers to the possibility of increasing supplies of selenium from available sources. Any selenium found in imported ores is evidently present because it could not be economically extracted in the country of supply, but conceivably there might be some stage during processing at which some degree of concentration might occur. The possibility that selenium might be economically recovered in Britain from some imported pyrites or copper sulphide ores may not be very great, but it should not be excluded without thorough investigation.

RUSSIA'S MINERAL RESOURCES—III

The Alloying Metals, Precious Metals and Non-Metallics

With this article we conclude our short series summarizing some of the conclusions regarding Russia's mineral industry contained in Professor Shimkin's book on "Minerals—A Key to Soviet Power," published by the Harvard University Press (London: Geoffrey Cumberlege) at 52s. net. It should be emphasized that this series has been purely selective, and that important sections of the book dealing with coal, petroleum, and iron and steel, have not been dealt with at all. Readers are again warned not to attempt to put Professor Shimkin's various estimates to practical use without familiarizing themselves with the basis on which he has constructed his "hypothetical standards," which are explained in detail in the second chapter of his book.

THE FERRO-ALLOYING METALS

Chromite.—As a result of continued expansion of output since 1926, the U.S.S.R. may now be the world's largest producer of chromite. Between 1927 and 1935, and again since 1944, it has been a major exporter of the ore. In 1946, the U.S. imported from the Soviet Union 98,952 l.tons of chromite, with a Cr_2O_3 content of 53,391 s.tons, or nearly 20 per cent of its chromite consumption in that year. Shimkin considers it safe to assume that Soviet chromite reserves aggregate fully 25,000,000-30,000,000 tonnes, an amount comfortably exceeding Hypothetical Standard requirements to 1970 for the entire Soviet sphere. In reviewing the supply position for the free world, the Paley Report places U.S. reserves directly usable by present practice at not more than 10,000 tons of chromite, mostly inferred, and foreign resources are estimated to be of the order of 300,000,000 tons of contained Cr_2O_3.

Cobalt.—Soviet cobalt production is described as a post-war phenomenon intimately linked with the rise of the nickel industry. The cobalt output of the entire Soviet sphere in 1950 was of the order of 200 to 400 tonnes, covering less than half the Hypothetical Standard demands of the U.S.S.R. alone. Soviet cobalt reserves, excluding as doubtful potentialities by-products from copper-zinc and manganese deposits in the Urals, are clearly inadequate for long-term self-sufficiency. Shimkin doubts whether the country's workable reserves (excluding those in Urals copper-zinc and manganese deposits) exceed 25,000 tonnes of content. On the other hand, the authors of the Paley Report consider the total reserves in the free world large enough to support the indicated future expansion in demand, while the U.S. should eventually be capable of satisfying more than half its domestic needs at the present level of consumption.

Manganese.—The U.S.S.R. claims about one-third of the world's known reserves of manganese. According to the Paley Report it possesses over half the known reserves. Exports to the U.S. were resumed on a moderate scale at the end of the war and in 1947 they amounted to 351,000 s.tons of ore, which constituted only 24 per cent of American supplies, in contrast with the pre-war average of 40 per cent. By 1950 Soviet manganese exports to the free world had virtually ceased. The U.S.S.R. ore reserves totalled 785,000,000 tonnes on January 1, 1938. In contrast, Hypothetical Standard requirements for manganese to 1970 would come to only some 22,000,000 tonnes in ore; even at the high Soviet rate of consumption, demands up to 1970 would only aggregate some 80,000,000 tonnes of ore in all (the Paley Report places the actual U.S.S.R. consumption of manganese ore at approximately 1,000,000 tons annually). On the other hand, the free world's total manganese ore requirement in 1975 is expected to be 5,000,000 tons, which would demand major new mining projects.

Molybdenum.—Firm data on the molybdenum position of the Soviet Union are exceptionally scanty, but Shimkin concludes that production has been very small, especially in relation to steel output, and that imports covered not only the great bulk of current consumption but also the growth of large stockpiles by the end of World War II. Increases in output have been claimed during and since the war; furthermore, moderate supplies are now available from Manchuria, Korea and Finland. A total Soviet supply of, say, 750 to 1,000 tonnes of molybdenum content in 1947 is not improbable, therefore, but it is considered very unlikely that the Soviets are approaching a 1950 output of even 70 per cent of Hypothetical Standard, or 2,500 to 3,400 tonnes of molybdenum content. While Soviet molybdenum reserves are not known, they are unquestionably far below the 190,000 tonnes of content that would be needed to meet this demand. In this respect the U.S.S.R. is in a very much less favourable position than the U.S., which produces more than nine-tenths of the world's output.

Tungsten.—Although the available evidence is fragmentary, it is also clear that the U.S.S.R. is a heavy importer of tungsten. Domestic production has been severely limited by the paucity of reserves, which in 1945 could scarcely have exceeded 25,000 to 30,000 tonnes of concentrates. Against these modest resources Soviet requirements to 1970 are considered to be overwhelming, especially in view of the low tungsten recoveries achieved in recent years—e.g., 56.5 per cent at Gumbeika in 1938. The free world's position in regard to tungsten is also unsatisfactory. The authors of the Paley Report consider that U.S. needs will have to be met increasingly from overseas and the future supply may well be inadequate during the next 25 years.

Vanadium.—So far as vanadium is concerned, the Soviet position is believed to be reasonably strong at the present time. Reserves in two Urals titano-magnetite deposits alone amply cover the country's foreseeable requirements. Between them they contain 54,000 tonnes, or approximately one-third of the total known reserves.

Nickel.—Soviet nickel resources—roughly 1,300,000 tonnes of metal content as of 1947—cover about 68 per cent of Hypothetical Standard demands to 1970. The possibility of sizeable additional discoveries, however, is very great. The total output of nickel for 1947 is placed at some 15,500 tonnes, which compares with 11,000 tonnes in 1945. The fourth Five-Year Plan called for a 90 per cent increase in nickel production between 1945 and 1950, or an output of some 21,000 tonnes.

TITANIUM

While the known titanium reserves of the U.S.S.R. exceed Hypothetical Standard Requirements to 1970 by a fair to large margin, they consist almost entirely of low-grade titano-magnetites, requiring elaborate concentration, which inherently restricts the range of economical utilization of titanium. Thus the development of an important titanium industry in the U.S.S.R. is unlikely at the present time.

URANIUM

The uranium resources at present known for the Soviet sphere are far inferior to those available in Africa and North America. They are confined to the bismuth-

uranium-cobalt-nickel ores of Eastern Germany; the pitchblende deposit of Joachimsthal in Czechoslavakia, now heavily depleted; a copper-uranium-mica deposit in Bulgaria; and, domestically, low-grade but possibly extensive uranium-vanadium deposits in Central Asia, as well as small but good betafite deposits from Lake Baikal and other regions north-east to the Aldan Shield. Authentic data on Soviet or satellite uranium outputs are naturally lacking. Shimkin's guess is an upswing from not more than 10 tonnes of U_3O_8 in 1945 to possibly 150 tonnes by 1950.

THE PRECIOUS METALS

The production of platinum metals in Russia has been on the downgrade during the last four decades. Before the first world war, Russia was overwhelmingly the world's largest producer, averaging 208,000-224,000 f.oz. annually. During the inter-war period, 1922-1940, output averaged only about 122,000 f.oz. Since then the Urals production has declined steadily, and it is doubtful whether it exceeded 61,000 f.oz. by 1947. The increasing production of the Noril'sk mine in Eastern Siberia, however, has compensated for the decline of the Urals. Shimkin concludes that, as a result, total national output has varied little between 1941 and 1947, the probable range being from 124,000 f.oz. at the earlier to 144,000 f.oz. at the later date. However, at least 20 per cent of the 1947 production consisted of the palladium characteristic of Noril'sk. This contrasts sharply with pre-war production, which was almost purely of platinum. The net effect of the downward trend in production, coupled with growing domestic requirements, will unquestionably be to reduce progressively Russia's importance as an exporter of platinum. On the other hand, Soviet platinum resources are almost certainly adequate to ensure self-sufficiency well beyond 1970.

Official statistics of gold production in the Soviet Union have long been withheld. The latest estimate given by the author is that of 4,000,000 oz. given for 1940 by the Director of the U.S. Mint. During 1943, 1944 and 1945, Lend Lease made gold shipments to the U.S. unnecessary. After the war they were resumed briefly until American exports were suspended. In 1946, the U.S.S.R. deposited in the U.S. 835,183 f.oz., Poland sent 53,212 f.oz., and Finland 41,775 f.oz. Notwithstanding the Soviet's anxiety to produce gold, the technological level of the industry has remained low.

NON-METALLICS

Asbestos.—High-grade reserves of asbestos in the U.S.S.R. are believed to be the greatest in the world. As at January 1, 1937, resources of asbestos, primarily chrysotile and excluding all lower than grade VI (with fibres 1.5 to 0.7 mm. long) totalled 19,300,000 tonnes. They have since been reduced by not more than ten per cent as a result of mining, but this reduction has been more than offset by new discoveries, particularly the Ak-Tovrak deposit in Eastern Siberia, with reserves of 1,500,000 tonnes. Thus Soviet asbestos resources are at least 2.5 times those required to meet domestic demands to 1970, without taking into account the short fibres utilized on a large scale in Canada and the U.S.

Mica.—Another notable feature of Soviet economy has been a very large expansion in the output of muscovite and phlogopite mica cuttings, which increased some twenty times between 1926 and 1939. This has permitted a corresponding shift from moderate consumption, based primarily on imports, to self-sufficiency at 50 per cent above Hypothetical Standard supply levels, a condition called for by the great expansion of the Soviet electrical industry. Statistics on output after 1939 are completely lacking, as are production goals.

Brazil's Fertilizers

Brazil, which has been importing over 250,000 tons of phosphates annually and large quantities of potash, will shortly be independent of foreign supplies of all fertilizing materials, except nitrates, writes our Brazilian correspondent.

Apatite occurs in limestone formations in Sao Paulo, Minas Geraes, Alagoas, Paraiba and Bahia; phosphoric bauxite in Maranham; organic phosphates at Trauiras, as also in Maranham, and on Alcatrazes Island, off the Sao Paulo coast. A deposit of calcium phosphate, with reserves of over 1,000,000 tons, exists on Rata Island, Fernando Noronha, and volcanic phosphates are found in Patos de Minas. The potassic rocks of Poços de Caldas, Minas Geraes, have visible reserves of 20,000,000 tons, with 10-14 per cent potassium content. Lime is found in all but two States and abundant raw materials exist for the preparation of organic nitrogen.

Prior to 1950 few of these natural resources were exploited. The apatite deposits of Ipiranga, with 11-20 per cent P_2O_5, and those of Jucupiranga and Morro Serroba, with 22-28 per cent, were worked on a small scale, the reserves ranging from 500,000 to 750,000 tons. In 1950, however, Federal and State governments began collaborating in the exploitation of the apatite deposits of Araxa, Minas Geraes, where the reserves are estimated at 100,000,000 tons. The Department of Mineral Production started to open up those at Camisao, Bahia, and Monteiro, Paraiba; to crush and pulverize the potassic rocks of Poços de Caldas; to study the possibilities of recovering potassium salts as a sub-product of the north-eastern salt pans and the concentration of nepheline and leucite for subsequent extraction of potassium salts. The S.A.L.T.E Plan, approved in 1950, allotted £1,100,000 towards the cost of prospecting apatite deposits and installing plant for industrial exploitation.

In the same year the Société Tunisienne de l'Hyperphosphate Reno founded a Brazilian subsidiary to prepare hyperphosphates, and two Brazilian groups, assisted by French capitalists, organized companies to produce hyperphosphates. In 1951 a new impetus was given to Brazil's incipient industry by the discovery of important deposits of phosphorite on two estates near Olinda, Pernambuco, with reserves of 49,000,000 tons and a P_2O_5 content varying from 6 to 22 per cent. Several firms combined to exploit the beds, which have an average thickness of 3.75 metres, and are easily worked. Plant is being installed to produce concentrates of phosphorite on a large scale.

The Department of Mineral Production is now examining another valuable deposit of rock phosphate discovered recently when drilling for water on Itapeçoca Island, off the coast of Pernambuco.

Development of San Francisco Valley

Brazil's San Francisco River flows 1,814 miles from the Cadastra Mountains, through Minas Geraes and Bahia, to the Atlantic at Penedo. For half its length navigation is impeded by cataracts and sand-banks and is sometimes known as the "Forgotten Valley." The 1946 Constitution, with a view to improving conditions, obliges the Union to devote one per cent of its revenue from taxation during 20 years to economic developments in the Valley. Falls are being harnessed to supply electricity at low rates, swamps are being drained, the river cleared of obstructions and dams and sluices built to regulate its flow. The mineral resources of the region will now be examined as part of the development plans. These include natural abrasives and raw materials for synthetic abrasives, chromite, sulphur minerals, copper, zinc, bauxite, vanadium, lead, rock, salt, potassium salts and gypsum.

Use of Atomic Power in Industry

Except for the occasional use of radioactive tracers, present-day industrial applications of atomic energy are somewhat removed from the metal-working industry. The following article, condensed from a lengthier version which appeared in Steel Vol. 132, No. 9, will therefore be of interest in that it explains the structural qualities of the metals needed and their existing limitations. The article concludes with a brief description of an experimental breeder reactor in operation at the Argonne National Laboratories in Chicago.

The end result of the use of atomic energy in industry will be heat-to-steam-to-electricity—probably on a large scale. At best, atomic energy will replace only the fire-box boilers of conventional plants, and therefore cannot have a revolutionary effect on our industrial economy. This is contrary to the popular misconception that a secret process is being sought which will miraculously make electric power free to the consumer.

Of the total cost of delivering power, about 20 per cent is accounted for by the cost of operating the thermal facilities; hence, atomic power will make no startling changes in cost. Reactors which use atomic fuels must have great thermal and electrical capacity in order to compete with low-cost fuels. Units to produce 100,000 to 200,000 kW. of electricity are being considered, though most manufacturing plants could not use units of this capacity for electricity or process steam.

In regard to a reactor for an automobile, it has been suggested by Dr. L. R. Hafstad, director of reactor development of the Atomic Energy Commission, that the reactor would consist of a critical mass of plutonium, possibly 1 or 2 ft. in diameter, surrounded by a concrete shield at least 6 ft. thick. Such a device, therefore, would hardly fit into the space occupied by the conventional gas tank.

Nuclear reactors are a new type of power machine, and they provide the most concentrated source of energy which has yet been devised. Gordon Dean, chief of the Atomic Energy Commission, predicts that the first stationary atomic power plants will probably be designed in 1953, and that they may be package units to be used in isolated areas where costs of handling fuel are abnormally high. The day may soon come when there will be a surplus of fissionable materials for non-military uses.

The most promising possibility is for the generation of electric power. Atomic energy, as it is known to-day, is simply a source of heat, the feature being the small amount of fuel which is needed to generate a large quantity of heat. One pound of fissionable material is equivalent to 1,500 tons of high-grade coal, or 200,000 gallons of diesel oil. In addition, the use of this material virtually eliminates the cost of fuel transportation.

In the proposed use of atomic power on a ship, the basic idea is to encase an electric motor in a stainless steel jacket, operating in a continuous stream of radioactive water which picks up heat from nuclear fuel, and then flows into a boiler where the heat is transferred to regular water, then to steam. The steam turns the turbines, which turn the propellers. In another marine experimental project, molten metal will be substituted for water as a coolant.

BASIC METALLURICAL REQUIREMENTS

The greatest need is for structural materials that will withstand heat plus neutron bombardment. Zirconium seems successful as a reactor core, according to results of experiments in ships. This newest of the "wonder" metals may well be the key to successful atomic power generation. It is a light and strong material, and it maintains its strength well at elevated temperatures. Most important, however, it does not absorb neutrons; hence, it leaves them free to promote further nuclear reaction. Other useful materials are : beryllium, boron, gallium, some of the rare earths, aluminium, titanium, and nickel and stainless steel tubing.

An important difficulty in adapting nuclear power to aircraft is the weight of the shield which is required to protect the crew and passengers from nuclear radiation. This weight may not be insurmountable. Suppose the shielding weighs 30 to 50 tons; long-range planes already carry as many as 60 tons of fuel.

Three basic requirements limit the selection of metals for use in power reactors : (1) resistance to radiation damage, (2) strength at high temperature, and (3) transparency to neutrons. Some of the stainless steels have good properties in these respects, except that their absorption of neutrons is rather high. Zirconium is good in all three respects, provided its common impurity—hafnium—is completely eliminated. Hafnium, however, is an excellent material for reactor control rods because of its high neutron-absorbing qualities, and it will become more important.

There are difficult metal problems in connection with heat transfer. If water is used as the heat-transfer medium between reactor and boiler, then heavy-walled, high-pressure plumbing is needed. This means high neutron absorption and reduced efficiency of the reactor. Molten sodium or sodium-potassium mixtures seem most promising, though these are difficult to handle, particularly at red heat. Problems such as the high-speed pumping of liquid metals at high temperatures are now receiving much attention.

THE BREEDER REACTOR

A breeder reactor which will produce more fissionable material than it consumes appears to be the most feasible for the generation of electric power on a long-range basis. In such a reactor, the core or critical mass contains fissionable materials which may be either uranium 235 or plutonium 239, the only definitely known useful fissile products.

The experimental breeder reactor which was designed by the Argonne National Laboratory (Chicago, Illinois) is the most advanced power reactor in operation to-day. By its use, attempts are being made to find out how much fuel can be produced in excess of the quantity which is burned. The reactor core is the size of a football. Liquid sodium-potassium alloy removes heat energy from the machine and generates a superheated steam, which flows through a 250 kW. turbogenerator system to produce electricity.

Surrounding the small control core is a breeding blanket of natural uranium. This blanket absorbs neutrons from the core to produce plutonium. A cylindrical tank which contains the sodium-potassium-alloy coolant holds the blanket and the fuel. Surrounding this tank is a reflector to turn back escaping neutrons. The entire atomic reactor is surrounded by a shield of lead and concrete in order to absorb the radiation produced by the fission process.

From a storage tank above the reactor, the coolant flows through the reactor by gravity. Electromagnetic pumps force it through a primary heat exchanger, and back to the storage tank. The entire system requires shielding because the coolant becomes radioactive in the process of flowing through the reactor. A secondary coolant system is required in which another sodium-potassium alloy removes the heat from the shielded exchange. This coolant does not become radioactive, since it does not flow through a reactor.

A small packaged atomic power plant will cost from $3,000,000 to $5,000,000, whereas a large central station costs $50,000,000 to $150,000,000.

MACHINERY AND EQUIPMENT

A Series of Rotary High Vacuum Pumps

The " Speedivac " series of rotary high vacuum pumps manufactured by W. Edwards and Company (London) Ltd., are designed for operation with all types of vacuum systems, and include such integral refinements as oil spray arrestors, oil level sight glasses and easy draining arrangements. Accessories comprise non-return valves, moisture traps and alternative vacuum connections. The pumps are supplied separately or as complete units with electric motor, belt drive and guard, while a push button starter is available.

The seven main pumps in the series comprise four single-stage and three two-stage units. The pump and compressor unit ISP30 has an ultimate vacuum at McLeod Gauge of 0.02 mm. of mercury, a normal running speed of 700 r.p.m. which can be reduced in the model LISP30 to 450 r.p.m. with correspondingly decreased displacement. Normal displacement in the ISP30, however, stands at 1.1 cu. ft. per min. at an oil capacity of 1.0 pints, while h.p. is $\frac{1}{4}$ at normal speed, although a $\frac{1}{4}$ h.p. drive may be fitted. The single-stage units grade through 1.7 and 5.1 cu. ft. displacement at normal speed to a new addition to the series, the IS450A. This pump has an ultimate vacuum at McLeod Gauge of 0.005 mm. of mercury, a normal running speed of 350 r.p.m. and a displacement at normal speed of 15.0 cu. ft. per min. Its oil capacity is 1.25 pints and the unit operates at 1 h.p. at normal speed.

The two-stage units all have normal running speeds of 450 r.p.m. and displacement at normal speed is respectively 0.8, 1.7 and 5.1 cu. ft. per min. Oil capacity is 1.0, 2.75 and 5.25 pints, while h.p. ranges from $\frac{1}{4}$ through $\frac{1}{3}$ to $\frac{1}{2}$. These are the 2S20, 2S50 and 2S150 models, of which the latter is a later addition to the range.

An Automatic Zinc Sampler

The conversion from industrial railway and hand handling of slab zinc to fork-truck handling made necessary an improved method of sampling, to replace the old drill press method. The solution of the American Zinc Company to the problem, as reported in *Journal of Metals*, is an automatic sampler which is capable of taking two simultaneously drilled samples from a 44-plate bundle, while positioned under the drill guides by the fork-truck. The drilling is done as the bundle is raised off the metal scales.

The operation of the drills is by a suspended push button, touched by the fork-truck operator by moving his left hand a few inches from the steering wheel. The whole operation is a natural action, and adds little to the duties of transportation and weighing.

In the twin drill unit constructed by the American Zinc Company, conventional parts are used except for the drill guides and chip collecting cups and chutes, and the apparatus is principally a simple motor-operated raising and lowering device. Much experimentation was needed to produce chips that would flow down the delivery chutes. Only a standard $\frac{1}{2}$-in. high-speed twist drill, driven at 1,760 r.p.m., with a feed of 0.0017 in. per revolution, seems to produce chips instead of spiral curls in drilling zinc, either hot or cold. Stainless-steel guide bushings have given the best nongalling, nonseizing service. The guide bushings must be without lubrication to avoid contamination.

This new combined conversion to transportation by fork-truck and the use of automatic sampling has reduced the size of the crew from eight men to two men, and has eliminated an industrial locomotive, rolling stock, and other equipment. Two fork-trucks, slab stacking racks, and the automatic sampler have been added. The result is an overall saving of about 60 per cent in handling metal from the furnaces to the railroad cars.

A New Drill-Hole Assaying Unit

A new drill-hole assaying unit that is lighter, more portable, more versatile and cheaper to build than similar instruments used for the detection and evaluation of uranium beneath surface, has been developed and satisfactorily tested by the United States Atomic Energy Commission.

Designed and fabricated by engineers of the Commission's New York Operations Office, the unit can be built for one-fourth the cost of other equipment designed to do the same job. It has the capacity and sensitivity of earlier, more bulky equipment which had the additional disadvantage of requiring truck mounting and high-powered electric generators for operation.

The entire instrument measures approximately 20 x 12 x 12 in., and complete with 2,000 ft. of cable, weighs less than 100 lb. It requires less than one-half of the power used by a car radio for complete operation, including electric drive for the cable reel.

The assaying unit has been designed to use either a scintillation counter or a Geiger counter as the radiation detector, depending on the size of the drill hole. The probe housing the scintillation counter is 2 in. in diameter and that housing the Geiger counter is 1 in. Both units are self-powered by hearing-aid type batteries and draw less current than a pen flashlight.

Normally, the cores removed from drill holes must be assayed to determine the amount of uranium present. With the new instrument, however, the amount of radioactivity and the depth at which it is located, are automatically recorded above the ground, as the probe is lowered down the drill hole. Measurements can be taken at the rate of 1 ft. or 10 ft. per minute.

Sand Pumps for the Mining Industry

The Denver Vertical Centrifugal Sand Pump is manufactured by the Denver Equipment Company to handle pulps without dilution or the attention of an operator. It will accommodate almost any product containing solids up to $\frac{1}{4}$ in. that will flow by gravity to the feed opening.

The operating principle is that the pulp flows by gravity directly into the pump bowl, and no sump or feed box is required under normal working conditions. The runner rotating on the vertical shaft has its intake opening directly under the feed bowl. A suction vortex is thus created that breaks down frothy pulp and prevents any accumulation of froth inside the bowl. These pumps range in size from the $\frac{1}{4}$ in. model with capacities (based on 25 per cent of solids by weight) of 15 gal. per min. and 27 dry tons per day, to the 4 in. model with capacities of 450 gal. per min. and 800 dry tons per day.

Longer Life for Wire Cables

One of the chief causes of failure in wire cables has traditionally arisen from the means available of anchoring or joining the cables or of attaching the loads at the ends or at points in the cable lengths. After ten years of research, E. H. Bentall and Co. Ltd. claim to have successfully overcome this difficulty.

The construction of Bentall patent cable fastenings is said to ensure that each of the strands of a cable is held separately and evenly between spirally-formed gripping surfaces which almost enclose the strand. The arrangement is such that initial differences of strand lay are rectified when the cable comes under load so that each strand takes its share of strain.

The gripping pressure at all points is radial to the axis of the cable, and to be secure, an end grip or clamp of usual construction must be applied to a length of cable not less than approximately 12 times the cable diameter. In the case of Bentall Type B fastenings, the standard axial length of the gripping surfaces is $2\frac{1}{2}$ times the cable diameter. The Type B fastenings are for end connections.

Tests on Type A fastenings have shown an actual breaking load to be 12.81 tons against a catalogued breaking load of 12.30 tons, and on Type B fastenings an actual breaking load of 8.02 tons against a catalogued load of 8.10 tons. In each case it is reported that the cable broke, while the fastening was not affected.

These fastenings are forwarded for use on excavators, aerial ropeways, dredgers, surface and underground haulages, colliery tub creepers, elevated track conveyors and tow ropes.

METALS, MINERALS AND ALLOYS

COPPER.—Caution continues to characterize the attitude of consumers of copper and there is little to report marketwise this week. Negotiations continue between the labour unions and the mining companies in Northern Rhodesia and between Washington and Santiago over the disposal of the present Chilean stocks of unsold copper. In this latter connection, the U.S. Defence Mobilization Board has agreed on recommendations to be made to the Secretary of State, Mr. Dulles, regarding the terms on which the U.S. would be prepared to purchase 84,000 tons of the Chilean copper surplus and their report has been transmitted to Congress. The Chairman of the Board, Mr. Arthur Fleming, would not disclose the terms of the recommendations, but the trade believes that they are substantially a compromise under which the U.S. would purchase for the stockpile the Chilean accumulation on the basis of 29 c. f.a.s. Chile, coupled with a loan of $30-35,000,000. Chile would then be in a position to sell its coming supplies on a world market basis. U.S. fabricators are believed to be well supplied with copper at the present time, and consumers are proceeding cautiously in the belief that the trend will be towards lower levels.

The Copper Institute's figures for July show production of U.S. primary domestic copper as 88,984 s.tons against 84,948 s.tons in June. Refined totalled 112,570 s.tons (124,480 in June). Deliveries were 104,593 s.tons (139,520 in June). Stocks were 77,100 s.tons (58,126), representing an increase in the month of 18,974 s.tons. Copper statistics for the rest of the world were, crude output 127,798 s.tons (133,239 in June). Refined output was 84,149 s.tons (104,137). Deliveries were 68,128 s.tons (74,198). Stocks rose by 11,470 tons to 166,306 (154,836 in June).

Japanese production of electrolytic in July was 6,755 tonnes, slightly down on the previous month but August output is expected to show an increase of some 1,250 tons. A Nippon Mining Company spokesman said that they were anticipating the export of 2,000 tons of this brand to the Argentine on a barter basis. Belgian Congo exports in the first half of this year are given as 94,937 tonnes, practically the same as in the same period of 1952.

LEAD.—This metal has continued to present a firm if somewhat holiday appearance, with a continuance of the backwardation on the London Metal Exchange. In the United States also a quiet and steady market is reported, with an active demand for September metal. There has been no change in quoted prices. A production of some 2,300 tons of concentrates is expected this year from a lead mine at Keban, in Turkey, which has now started production after reorganization.

TIN.—The market in London and also in the United States has been inclined to strengthen since last week but the advance is not appreciable. Meanwhile output figures still show no tendency to decline. Nothing further has transpired regarding the negotiations between the U.S. Administration and Bolivia but Sr. Rosalez, vice-president of the Bolivian Mining Corporation is reported to have said that he expected "the slump" in the Bolivian tin industry to continue until the end of the year. We get no information regarding the situation at the producing mines but exports of late have been at an exceptionally high rate to the end of May and the July imports of concentrates into the U.K. were 5,616 tons raising receipts in the first seven months at 25,994 tons, over 1,000 tons up on the same period last year when they were 24,878 for the like period. Sr. Rosalez also mentioned that the services of German technicians to work in the nationalized mines had been contracted for.

With further reference to the participation of the United States in the reconvening of the International Tin Conference, it was pointed out that the Administration could not determine its position on such a fundamental policy question as a tin agreement until the Foreign Economic Policy Commission had reported. Its findings are not scheduled for report until next March.

Malayan output in July was 4,705 tons, the best since March, compared with 4,262 tons in June and 4,847 tons in July, 1952. Total output to date this year is 32,236 tons (33,047 last year). To the end of July, therefore, the slump in prices has not appreciably affected output. The Malayan and Straits governments are now reported to have announced officially that they support the reconvening of the International Tin Conference; but while the opinion of the majority of producers is in favour of this step, the minority still believe that, whatever may be the case in other countries, Malaya is in a strong competitive position *vis-a-vis* other producing fields. On a long-term view, so long as no further prospecting is undertaken which might reveal deposits hitherto unworked, natural restriction of output will tend to operate as ore reserves become progressively depleted.

Indonesian shipments in July rose sharply to 3,508 tons compared with 2,478 tons in June, and for the first seven months of the year totalled 17,595 tons as compared with 17,052 for the same period of last year.

Shipments of tinplate from the U.S. mills for the first half of the year showed a continuance of the gain of electrolytic tinplate over hot dipped. Electrolytic tinplate totalled 1,866,698 s.tons compared with 729,924 for hot dipped. Corresponding figures for the first half of last year were 1,359,341 and 612,197 s.tons. A substantial decline in tinplate shipments during the last quarter of the year is confidently expected.

ZINC.—Prices have eased slightly on the Metal Exchange this week but the general tone remains steady. In the United States business has been small with consumers following a hand-to-mouth buying policy in view of the full supply position and the availability of some cheap-priced foreign metal. There has been some easing in the quotation for some special high grade at 12.50 c. per lb. while the demand is reported to have considerably moderated.

ALUMINIUM.—The action of the Department of Justice in seeking to prevent the sale of 600,000 tons of aluminium by Alcan to Alcoa continues to be adversely criticized in the United States. Alcoa has now issued a third chapter in its rebuttal of the move by the Department of Justice. Harvey Aluminium Inc. has applied to the Federal Power Commission for a preliminary permit for a hydro-electric project on the Copper River in Alaska. An installed capacity of 1,475,000 h.p. is envisaged. The United States output for the first half of the year is reported as 598,691 s.tons. Annual production has gone up regularly since 1949, and is expected to reach 1,200,000 tons for the whole of the current year. Austrian production also is on the increase, and with a May output of 5,780 tonnes, the first five months of the year totalled 15,347 against 12,010 tonnes in the same period of last year.

It is reported from Oslo that construction of the new aluminium plant at Sunndalsora is ahead of schedule and it is hoped to start production next year. Initial output should be at the annual rate of 40,000 tonnes to be increased later. Present Norwegian production is around 50,000 yearly so that the production should be nearly double. The plant is being built with the help of a U.S. loan, with repayment in the form of aluminium at the rate of 8,000 tonnes yearly. The government company constructing the plant already operates the Ardal plant constructed after the war.

CADMIUM.—Production of cadmium metal in the United States is steadily on the upgrade. The June output was an all-time record at 422 s.tons making the half-year's total 2,394 s.tons. Imports in May decreased sensibly but the Bureau of Mines had not received the June import figures when their report was issued.

CHROME.—Production in Turkey appears to be on an increasing scale and the output this year will, it is estimated, reach 180,000 tons, 20,000 tons more than in 1950.

MAGNESIUM.—The White Metal Rolling and Stamping Corporation of Brooklyn is planning the production of all-magnesium trailer-type truckbodies with a substantial saving of weight on similar bodies made of aluminium and still more over steel truckbodies, the respective weights being 850 lb., 1,300 lb. and 2,200 lb. Deliveries should be available shortly.

MANGANESE.—The American Iron and Steel Institute reports imports of contained manganese in 1952 at the record figure of 969,000 s.tons. Imports for the first quarter of the

current year totalled 354,115 s.tons, the principal suppliers being India 124,148, South Africa 54,545, Gold Coast 49,116, and Cuba 39,919.

TUNGSTEN.—There is no feature to note this week though the market seems to be temporarily weaker, possibly due to the holiday season.

Minerals Engineering Co. of Grand Junction, Colorado, has recently organized an affiliate named the Salt Lake Tungsten Co. to build a tungsten refinery in Salt Lake City.

URANIUM.—Herr Otto Grotewohl recently announced that the Soviet owned Wismuth Company, which had mined millions of tons of uraniferous materials in East Germany since the end of the War, has been transformed into a mixed German-Russian company in which each government will have equal shares. According to Allied reports about 200 shafts have been sunk in the Erzgebirge where some 300,000 workers voluntary and slave are employed.

In Melbourne a new company, Uranium Mines N.L., is being formed in response to the Government policy to encourage private enterprise.

GOLD.—United States output for the first half year was 884,266 f.oz., as compared with 834,804 f.oz. for the same period in 1952; both figures showed considerable reduction on the first half of 1951.

Iron and Steel

The iron and steel trade is now very nearly back to normal. Most of the workers have returned to duty after the holidays and outputs are rapidly expanding. The loss of production during the holiday period has, however, been unusually severe, and a sustained effort will now be needed to reach the industry's target figures for the year.

Producers have the assurance of more abundant supplies of iron ore and scrap, stocks of which have reached the highest level since 1950, but the coke position still causes anxiety and will continue to do so until coking capacity is increased. Export business is also very difficult. Various overseas markets, as for instance Finland, Egypt, Argentina and Brazil, are virtually closed and elsewhere sales are limited by import restrictions. On the other hand home requirements are extensive, and granted a freedom from serious wage disputes, a hopeful view is taken of the outlook.

Demand for pig iron is limited by the slackness in the light castings trade but on the other hand steel makers are now beginning to requisition bigger tonnages of basic iron, whilst the output of haematite is barely sufficient to meet all requirements.

Re-rollers now hold ample stocks of semi-manufactured steel but the continued absence of foreign trade is thinning out their order books and even the sheet makers are now seeking orders for the lighter gauges of sheets. During the past three months this branch of the industry has enjoyed strong support from the U.S. and Canada, but American interest has now waned.

Mills engaged upon steel plates, heavy joists, sections and rails have entered upon the autumn period with substantial rolling programmes and it is difficult to place orders with the assurance of prompt delivery. Forward buying on the other hand is limited because of the expectation that prices may shortly be adjusted. In the meantime it is learnt that prices of galvanized sheets and tubes will remain unchanged at least until the end of September.

The scrap position is healthy. Deliveries are back to normal. Substantial stocks are in hand and steel makers are still keen buyers of good heavy melting scrap.

The London Metal Market

(From Our Metal Exchange Correspondent)

The firmness in the tin market apparent last week was followed on Friday by a drop of £11 in the Eastern quotation, which was reflected in the London market by a somewhat larger fall, but a good recovery has since taken place and the price is back again to about the level ruling on Thursday last. Efforts to reconvene the Geneva Conference on tin continue, and no doubt an attempt will be made to bring into being an international agreement for the metal, which would include the formation of a buffer stock to hold surplus supplies off the market and help to stabilize prices. It is understood that the United States has now agreed to a reconvening of the Geneva Conference but does not bind herself to be committed by anything to which the delegates may agree. The Eastern price on Thursday morning was equivalent to £626¼ per ton c.i.f. Europe.

In copper there has been some holding back by consumers this week, both here and on the Continent, which was followed by a sharp fall in quotations, but a moderate recovery has since taken place.

Quiet conditions have prevailed in the lead market, but the tone remains firm, and the backwardation is still nearly £6 per ton.

Zinc has been an easier market, but any improvement in demand would no doubt soon be reflected in prices.

Closing prices and turnovers for the week are given in the following table:

	August 20		August 27	
	Buyers	*Sellers*	*Buyers*	*Sellers*
Tin				
Cash	£610	£612½	£602½	£605
Three months	£605	£607½	£600	£602½
Settlement	£612½		£605	
Week's turnover	515 tons		440 tons	
Lead				
Current month	£95	£95¼	£97¼	£98
Three months	£88¾	£89¼	£91¼	£91¾
Week's turnover	6,650 tons		3,075 tons	
Zinc				
Current month	£72¼	£72¾	£72¼	£72⅞
Three months	£72¼	£72¾	£72¼	£72⅞
Week's turnover	4,250 tons		3,175 tons	
Copper				
Cash	£230	£235	£226	£230
Three months	£215½	£216½	£211½	£212
Settlement	£235		£230	
Week's Turnover	4,325 tons		2,275 tons	

AUGUST 27 PRICES

COPPER, TIN, LEAD AND ZINC

(See our London Metal Exchange report for Thursday's prices)

ANTIMONY

English (99%) delivered, 10 cwt. and over .. .. .. £225 per ton
Crude (70%) .. .. .. £210 per ton
Ore (60% basis) .. .. .. 20s. — 22s. nom. per unit, c.i.f.

NICKEL

99.5% (home trade) .. .. £483 per ton

OTHER METALS

Aluminium, 99·5% £150 per ton
Bismuth (min. 4 cwt. lots) 16s. 6d. lb.
Cadmium (Empire), 13s. 10d./14s. 4d. lb.
Chromium, 6s. 5d./7s. 6d. lb.
Cobalt, 20s. lb.
Gold, 248s. f.oz.
Iridium, £60 oz. nom.
Magnesium, 2s. 10½d. lb.
Manganese Metal (96%-98%) £280/£295
Osmiridium, £40 oz. nom.
Osmium, £65/70 oz. nom.
Palladium, £7 15s./£8 10s. oz.
Platinum, £27/£33 5s.
Rhodium, £42 10s. oz.
Ruthenium, £25 oz.
Quicksilver, £70 5s./£70 10s. ex-warehouse
Selenium, 30s. 6d. nom. per lb.
Silver 74d. f.oz. spot and f'd
Tellurium, 15s./16s. lb.

ORES, ALLOYS, ETC.

Bismuth .. .. 65% 8s. 6d. lb. c.i.f.
60% 8s. 3d. lb. c.i.f.
Chrome Ore—
Rhodesian Metallurgical (lumpy) £14 8s. 0d. per ton c.i.f.
„ „ (concentrates) £14 8s. 0d. per ton c.i.f.
„ „ Refractory £14 0s. 0d. per ton c.i.f.
Baluchistan Metallurgical .. £16 11s. 6d. per ton c.i.f.
Magnesite, ground calcined .. £26 - £27 d/d
Magnesite, Raw .. .. .. £10 - £11 d/d
Molybdenite (85% basis) .. 103s. 10½d. per unit c.i.f.
Wolfram (65%) .. .. .. World buying 305s. - 315s.
„ „ .. .. .. 327s. 6d. U.K. Selling
Scheelite .. .. World buying 290s. - 300s.
„ .. .. 312s. 6d. U.K. Selling
Tungsten Metal Powder .. .. 24s. 3d. nom. per lb. (98% Min. W.) (home)
Ferro-tungsten .. .. .. 21s. 4d. nom. per lb. (home)
Carbide, 4-cwt. lots .. .. £35 13s. 9d. d/d per ton
Ferro-manganese, home .. .. £49 15s. 0d. per ton
Manganese Ore Indian c.i.f. Europe (46%-48%) .. .. .. 7s. 11d. - 8s. 7d. per unit
Brass Wire .. .. 2s. 5¾d. per lb. basis
Brass Tubes, solid drawn .. 1s. 10d. per lb. basis

THE MINING MARKETS

(By Our Stock Exchange Correspondent)

Markets received a setback this week. While this was caused by a shake out after the recent steady gains, it seems probable that there was some reaction from the falls in Wall Street and the electricians' strike at home. In addition, the coal reserve figures are again bad. The economic significance is that to-day we barely produce enough for our own use, whereas before the war we were a large net exporter. This export of coal paid for many imports from the Continent and provided a steady trade for our coastal shipping. To-day, high wages, voluntary absenteeism, longer holidays and less work, all take their toll on the national economy.

Gilt-edged went ahead. The strength of this market was noticeable in the face of a new £4,500,000 issue by East Africa. This will take the form of a 4 per cent stock dated 1968/71 issued at 95 per cent.

Kaffirs settled down to normal conditions with the end of the French strike. No business, however, resulted, and a general downward drift occurred. Johannesburg was a very dull market and trading conditions were at a standstill. The Cape appeared to be awaiting a political lead. The Union is still losing foreign exchange and the Government has been borrowing from the reserve bank. The mining industry is in a state of near-depression and both major parties feel that some action must be taken soon.

Working costs for the Transvaal mines fell in July to 35s. 8d. a ton against 36s. 4d. for June. While the previous month covered the Coronation period, these figures are encouraging when set against costs of 35s. 5d. for May. The total profits were the best since March this year. A less attractive feature is the continued deterioration in the supply of native labour.

Most shares were featureless but Doornfontein fell on the poor reef results from the No. 1 shaft intersection. This caused a general marking down in all leading West Rand shares. The market was definitely disappointed and the results tend to confirm that reef values become lower the further removed they are from the neighbouring Blyvoor property. The Dominion Reefs "A" Shares, which started at around 9s. 6d. each, also declined to 8s. 6d. They carry the option of taking four new 5s. shares at par for every 13 held until January 31, 1955.

Orange Free State market conditions were similar. Details concerning the Free State Geduld note issue turned the shares slightly easier.

Demand developed for leaders in the diamond group and a steady advance occurred. Favourable comment in the daily press on the investment status of De Beers Preferred Shares brought in buyers. Platinums turned easier despite the increased final dividend by Potgietersrust. The company is paying 6d. making 10d. for the year against 9d. previously. The South African producers' price is still well below the world free price despite the recent fall in the latter. The easier tendency is connected with rumours of a Russian re-entry and the possibility of future world over-production.

Tin shares started the week firm but later suffered a slight setback on the lower metal price. The market generally was very quiet. Beralts rose in anticipation of the final dividend.

Demand developed for Central Provinces Manganese and Cape Asbestos shares. Wankie, however, fell sharply on news of the new issue. Reports indicate that some 2,206,250 new ordinary shares will be issued at par and also suggest an issue of £3,500,000 of 5½ per cent 1st Mortgage Debenture Stock at 98 per cent. An official announcement and details are expected shortly.

Canadians were all lower following the continued decline in the prices on Wall Street. This fall appears to have some seasonal cause but may also be affected by the general feeling of uncertainty in the North American market. Base metal issues were particularly vulnerable. Gold shares were also down following a statement in Toronto concerning production losses and criticizing the Federal Government's gold policy. The commencement of a labour strike at Noranda added to the gloom.

	Price Aug. 26	+ or — on week
FINANCE		
African & European	2 3/32	—1/32
Anglo American Corpn.	5 5/32	—1/8
Anglo-French	18/1¼	
Anglo Transvaal Consol.	21/3	
Central Mining (£1 shrs.)	28/9	—1/3
Consolidated Goldfields	45/9	—3d
Consol. Mines Selection	25/7½	
East Rand Consols	2/6	—1½d
General Mining	3¾	
H.E. Prop	38/9	
Henderson's Transvaal	7/6	
Johnnies	52/-	+9d
Rand Mines	3¼	—1/16
Rand Selection	31/3	—7½d
Strathmore Consol.	30/-	—2/6
Union Corp. (2/6 units)	27/9	—6d
Vereeniging Estates	3 7/16	
Writs	33/9	—1/3
West Wits	42/6	
RAND GOLD		
Blyvoors	39/9	—9d
Brakpan	11/-	—4½d
City Deep	19/6	—6d
Consol. Main Reef	18/9	
Crown	33/1½	—7½d
Daggas	3 31/32	—1/32
Doornfontein	21/9	—1/3
Durban Deep	35/7½	—7½d
E. Daggas	13/-	—1/6
E. Geduld (4/- units)	33/-	—9d
E. Rand Props	2 31/32	+3/32
Geduld	4¼	
Govt. Areas	12/6	—6d
Grootvlei	22/6	—6d
Libanon	9/6	—3d
Luipaards Vlei	21/9	—9d
Marievale	18/6	
Modderfontein East	17/6	
New Kleinfontein	19/6	
New Pioneer	17/6	
Randfontein	42/3	—3d
Robinson Deep	10/9	
Rose Deep	13/1½	—7½d
Simmer & Jack	4/9	—3d
S.A. Lands	23/9	—7½d
Springs	4/4½	—4½d
Stilfontein	27/10½	—1½d
Sub Nigel	2¼	—1/32
Van Dyk	5/9	—6d
Venterspost	12/9	—6d
Vlakfontein	14/-	
Vogelstruisbult	32/3	—6d
West Driefontein	6 31/32	—1/32
W. Rand Consolidated	53/1½	—1/3
Western Reefs	48/9	—7½d
O.F.S.		
Freddies	10/4½	—1½d
Freddies N.	9/9	—3d
Freddies S.	9/3	—1½d
F. S. Geduld	2 29/32	—1/32
Geoffries	14/6	—3d
Harmony	23/9	—3d
Loraine	8/7½	—3d
Lydenburg Estates	12/-	—6d
Merriespruit	8/9	—3d
Middle Wits	15/3	—6d
Ofsits	36/-	—10½d
President Brand	27/7½	—4½d
President Steyn	21/7½	
St. Helena	12/10½	—3d
Virginia Ord.	12/6	—3d
Welkom	20/3	
Western Holdings	3 7/32	—1/32
WEST AFRICAN GOLD		
Amalgamated Banket	1/9	+1½d
Ariston	6/3	
Ashanti	21/9	—3d
Bibiani	5/9	
Bremang	2/3	
G.C. Main Reef	3/7½	
G.C. Selection Trust	6/4½	
Konongo	2/7½	
Lyndhurst Deep	1/-	
Marlu	1/4½	
Taquah & Abosso	3/9	+4½d
AUSTRALIAN GOLD		
Boulder Perseverance	2/6XD	—1½d
Gold Mines of Kalgoorlie	14/3	+9d
Great Boulder Prop.	10/-	—1½d
Lake View and Star	15/-	
Mount Morgan	17/9	—4½d
North Kalgurli	7/-	+1½d
Sons of Gwalia	6/3	
South Kalgurli	6/10½	
Western Mining	13/4½	+1½d
MISCELLANEOUS GOLD		
Cam and Motor	9/3	
Champion Reef	5/-	
Falcon Mines	6/4½	—1½d
Globe & Phoenix	25/3	
G.F. Rhodesian	5/-	
London & Rhodesian	5/-	+1½d
Motapa	1/6	
Mysore	3/-	
Nundydroog	6/1½	+4½d
Ooregum	4/3	+1/-
Oroville	11/9	+1/6
MISCELLANEOUS GOLD (contd.)		
St. John d'El Rey	25/6	+1/-
Zams	25/3	—6d
DIAMONDS & PLATINUM		
Anglo American Inv.	3 3/8	+3/32
Casts	20/-	+9d
Cons. Diam. of S.W.A.	4½	+1/16
De Beers Defd. Bearer	63/9	+1/-
De Beers Pfd. Bearer	15¼	+¼
Pots Platinum	7/9	—1½d
Watervaal	12/6	—6d
COPPER		
Chartered	52/3	+1/-
Esperanza	4/4½	
Indian Copper	4/-	
Messina	3¾	+1/32
Nchanga	6 7/16	
Rhod. Anglo-American	48/9	—1/-
Rhod. Katanga	7/6	—10½d
Rhodesian Selection	14/4½	—7½d
Rhokana	18 9/16	—1/16
Rio Tinto	20½	
Roan Antelope	13/3	—1½d
Selection Trust	32/6	+7½d
Tanks	58/6	
Tharsis Sulphur Br.	41/3	
TIN (Eastern)		
Ayer Hitam	25/-	+1/-
Bangrin	8/3	
Gopeng	8/3	
Hongkong	6/3	
Ipoh	14/4½	—7½d
Kamunting	8/-	+1½d
Kepong Dredging	4/4½	
Kinta Tin Mines	10/-	
Malayan Dredging	22/6	—3d
Pahang	12/9	
Pengkalen	8/-	+6d
Petaling	8/9	—3d
Rambutan	10/6	
Siamese Tin	9/-	—3d
Southern Kinta	12/6	
S. Malayan	22/-	—9d
S. Tronoh	8/1½	—7½d
Sungei Kinta	10/-	
Tekka Taiping	4/9	
Tronoh	22/6	
TIN (Nigerian and Miscellaneous)		
Amalgamated Tin	9/1½	—1½d
Beralt Tin	29/-	+9d
Bisichi	3/10½	—1½d
British Tin Inv.	13/6	+1½d
Ex-Lands Nigeria	3/7½	—1½d
TIN (Nigerian and Miscellaneous) contd.		
Geevor Tin	10/-XD	+3d
Gold & Base Metal	3/6	
Jantar Nigeria	14/6	—3d
Jos Tin Area	11/3	
Kaduna Prospectors	2/-	
Kaduna Syndicate	2/-	
London Tin	4/10½	
United Tin	2/3	—1½d
SILVER, LEAD, ZINC		
Broken Hill South	43/9	
Burma Mines	1/6	
Consol. Zinc	25/9	—6d
Lake George	9/9	—1½d
Mount Isa	32/9	
New Broken Hill	22/6	—1/6
North Broken Hill	56/10½	
Rhodesian Broken Hill	10/7½	+3d
San Francisco Mines	18/9	—6d
Uruwira	2/10½	—1½d
MISCELLANEOUS		
BASE METALS & COAL		
Amal. Collieries of S.A.	44/6	
Associated Manganese	47/6	—6d
Cape Asbestos	21/6	+9d
C.P. Manganese	55/-	+2/6
Consol. Murchison	22/9	—3d
Mashaba	4½d	
Natal Navigation	3¼	
Rhod. Monteleo	5/-	
Turner & Newall	55/3	—3d
Wankie	12/3	—1/3
Witbank Colliery	3 29/32 XD	—1/16
CANADIAN MINES		
Dome	$32½	—1½
Hollinger	$25	—1½
Hudson Bay Mining	$78	—4
International Nickel	$73½	—2½
Mining Corpn. of Canada	£4½	—1/16
Noranda	$124	—3
Quemont	£6½	
Yukon	4/-	
OIL		
Anglo-Iranian	7½	—¼
Apex	38/9	—7½d
Attock	34/-	—4½d
Burmah	54/-	—9d
Canadian Eagle	28/9	—6d
Mexican Eagle	22/-	—3d
Shell (bearer)	4 1/32	—1/4
Trinidad Leasehold	27/-	—1/-
T.P.D.	23/9	—3d
Ultramar	26/-	—1/3

COMPANY NEWS AND VIEWS

Western Mining Corporation's Interesting Outlook

Formed in 1933 to operate along much the same lines as the South African mining finance houses, Western Mining Corporation is one of the largest organizations in the Australian gold mining industry and also one of the youngest

Year to Mar. 31	Dividend Income £A	Gross Revenue £A	Expenses £A	Net Profit £A	Dividend s. d.	Forward Balance £A
1953	192,952	214,554	25,299	185,157	1 0	534,315
1952	61,679	91,654	17,748	71,439	6	488,876
1951	106,922	128,152	26,541	101,611	6	487,296

The healthy profit expansion, apparent from the above table, of Western Mining Corporation during the year to March 31 last was due principally to the increase in the dividends received from Central Norseman whose total distribution was raised from 6d. to 2s. 6d. per share. The exact increase in income received from Central Norseman compared with the preceding year was £A131,251 making the total received from this source £A164,063. Shareholders participated in the better results and received 1s. per share as against 6d. per share in 1951-52.

The Corporation interests extend throughout Australia and together with Gold Mines of Australia, which is the management company for the group in Eastern Australia, they act as general managers to the various companies in the W.M.C. Group. The table at the bottom of this page shows the Corporation's interests as at March 31, 1952.

Of particular interest was the coming into production in November last of Great Western Consolidated, which is the latest mine to commence operations in Western Australia. The company commenced with a throughput of 21.000 tons per 4 week period, since which time it has reached a level of 32,000 tons per 4 week period in June last. At present, mining is confined to the copperhead ore body, both underground and open cut ore being treated. After exhaustion of the open cut ore, however, it will be entirely an underground proposition.

Of the other gold producers in the group, New Coolgardie merits attention for its net profit of £A140,351 for the year to March 31 last—a record for the company which enabled it to apply a large part of the surplus for the reduction of its bank overdraft and debt to Western Mining Corporation. Since the end of the company's financial year it has paid a maiden dividend of 6d. per share, which should help to augment the dividend income of Western Mining Corporation during the current year.

Kalgoorlie Southern Gold Mines carries a heavy responsibility in that strong hopes are entertained that it will find a repetition of the Kalgoorlie system of ore veins in areas south of the Golden Mile, which it is now testing by diamond drilling. At the date of the latest report and accounts four holes had been drilled and the resultant data considered encouraging. In particular, the discovery of the Cavalier fold means there are three main possibilities Firstly, the major ore repetition may be in the Kalgoorlie folding; secondly, the major ore repetition may lie further south in the Cavalier fold; or finally, it may mean that a smaller but important ore position may be found in the Kalgoorlie folding with the prospect of a major repetition occurring further south in the Cavalier syncline.

One way and another, therefore, the Western Mining Corporation Group of Companies present interesting possibilities. In the immediate future, the Corporation, barring unforeseen accidents, should do even better than last year as New Coolgardie's entry into the list of dividend payers will swell its income; Central Victoria Dredging is forging ahead steadily, while on current evidence both Central Norseman and Gold Mines of Kalgoorlie have sound hopes of maintaining their current year's total distribution at the same level as the year under review. The medium term outlook depends to some extent on the progress made at Great Western Consolidated, while, in the long run, the opportunity for a big expansion in the Group's mining activities rests on the results achieved by Kalgoorlie Southern in its efforts to discover areas similar to that existing on the Golden Mile.

Mr. G. Lindesay Clark is chairman and managing director. Meeting, Melbourne, September 10.

Mount Coolon's Outlook Brighter in Current Year

The principal income producing asset of Mount Coolon Gold Mines N.L. is its holding of 102,100 4s. shares of Morning Star (G.M.A.) N.L. and in the absence of any dividend from this source during 1952 the company was compelled to rely on income derived from its Commonwealth securities which brought in a mere £A106 net. Yet the current year's picture will in no sense form another chapter of the same story. For Morning Star (G.M.A.) paid 1s. per share on March 27 last and a further 1s. per share was paid on July 7 last. Moreover, the company holds 90,000 3s. shares of Atlas Gold Mines N.L. which, on winding up, paid a first and final dividend of 1.7d. per share thus raising Mount Coolon's total undistributed dividend income to £A13,959.

Year to Dec. 31	Gross Revenue £A	Expenses £A	Tax £A	Net Profit £A	Dividend	Carry* Forward £A
1952	106	523	Nil	Dr. 523	Nil	32,393
1951	5,289	989	25	4,275	6d.	32,916
1950	13,130	766	159	12,205	Nil	44,016

*Subject to payment to Gold Mines of Australia of management fee of 2½ per cent, on distribution to shareholders.

To pay a dividend of 6d. per 10s. share on its £A300,000 issued capital requires £A15,000 so that the distribution of a possible 6d. per share rests on whether Morning Star declares a further distribution in time.

Gold producing Companies	W.M.C's Holdings of issued capital Shares/Stock	%	Year to March 31	Tons Milled	Grade (dwt.)	Yield (oz.)	Bullion Revenue§ £A	Gold Premium (a) £A	Taxation £A	Net Profit £A	Dividend s. d.	Carry Forward £A
Central Norseman ..... £A650,000 in 5/- shares	1,312,500	50	1953 1952	161,444 149,088	9·7 6·6	78,591 49,091	1,229,714 773,838	71,512 26,527	2,270 1,070	614,745 207,987	2 6 6	550,579 260,834
G.M.K.(Aust.) ..... £A768,437 in 10/- stocks	462,227	30	1953 1952(b)	173,789 170,770	5·6 5·5	49,472 47,018	757,290 729,530	44,855 21,436	NIL NIL	164,319 180,616	1 3 1 3	102,692 —
New Coolgardie ..... £A426,000 in 10/- shares	532,000	62	1953 1952	65,029 53,156	10·7 9·9	34,956 26,259	541,823 406,505	31,987 13,236	229 269	140,351 58,217	NIL NIL	270,124 129,875
Gt. Western Consol.* ..... £A1,768,000 in 10/- shares	500,000	14	1953 1952	119,187* —	2·4 —	14,128 —	218,888 —	11,575 —	505 —	L11,800 —	NIL —	— —
Central Victoria Dredging ..... £A390,000 in 10/- shares	395,500	50	1953 1952	2,282·5† 2,281·5†	2·4‡ 2·1‡	11,220 10,025	173,419 154,882	10,212 4,526	11 95	44,189 48,026	NIL NIL	144,103 100,384
PROSPECTING ETC. COMPANIES **Gold Mines of Australia (c)** ..... £A52,219 in 2/6d. shares	260,500	62	1953	Management company for W.M.C. group in Eastern Australia.								
Victoria Gold Dredging ..... £A129,500 (d)	110,600	44	1953	Ceased operations, and now holds 125,000 fully paid shares in Central Victoria Dredging. These will be distributed to shareholders when it is possible to liquidate the company.								
Kalgoorlie Southern ..... £A185,225 in 5/- shares (e)	154,240	20	1953	Company is testing areas south of the Golden Mile by diamond drilling for a repetition of the Kalgoorlie system.								

*Production commenced in November 1952. †Cu. Yds. ‡Grains per cu. yd. §After realization charges. (a) After adjustments to include small additional gold premium receipts accruing from 1951-52 production. (b) Figures given are for complete year, viz.: 28.3.51 to 25.3.52 for comparative purposes. Company was registered in Australia on October 9, 1952. Dividend of 1s. 3d. for year distributed as between G.M.K. Ltd. 9d. (stg.) and 6d. Aust. (c) Company acts as General Managers and Consultants to Victoria Gold Dredging, Morning Star G.M.A., Mount Coolon Gold Mines and Central Victoria Gold Dredging. (d) As at July 8, 1953. (e) 9,000 £1 shares fully paid and 241,000 £1 shares paid to 10/-. (L) Loss

The company also holds 35,300 fully paid 10s. shares in Great Western Consolidated whose treatment plant commenced operations in November last. Meeting, Melbourne, September 1.

Morning Star's High Grade Ore

Though it is one of the smaller gold mines operating in Australia, Morning Star (G.M.A.) overcomes this disadvantage by sending high-grade ore to the mill.

Year to Mar. 31	*Milled (tons)*	*Yield (oz.)*	*Grade (dwt.)*	*Cost† A.shill*	*Ore (tons)*	*Reserves (dwt.)*
1953	19,606	15,548*	15.8	147.1	50,500	15.5
1952	18,600	9,679	10.4	123.7	51,000	12.5
1951	15,902	11,453	14.5	117.1	61,000	14.0

*Excluding 231 tons concentrates assaying 47.4 dwt. per ton recovered and stacked for treatment at a later date.
†Per ton, including development charges.

During the year to March 31 last, tonnage throughput advanced by just over 1,000 tons but the average grade treated rose by as much as 5.4 dwt. per ton to 15.8 dwt. per ton thereby enabling total gold production to increase by 5,869 f.oz. to 15,548 f.oz. A similar favourable impact was also reflected in the higher average grade of the ore reserves.

Costs were high, the increases being due to higher charges for stores and labour, but even so the good results flowing from the expanded gold production were not seriously affected and the full benefits can be seen at a glance under each heading in the table below.

Year to Mar. 31	*Gross Revenue £A*	*Mining Costs £A*	*Tax £A*	*Net Profit £A*	*Dividend s. d.*	*Carry Forward £A*
1953	300,334*	145,252	3	109,313	1 0	138,908
1952	158,696*	115,484	106	35,654	1 0	60,286
1951	177,038	93,428	125	77,773	1 9	72,255

*Includes revenue received from Premium Gold Sales.

Since the close of the financial year under review the company has paid a dividend of 1s. per 4s. share on the £A100,000 issued capital. Meeting, Melbourne, September 7.

Naraguta Extended Produces, Earns, and Pays Less

A preliminary profit statement issued by Naraguta Extended Areas covering the company's operations for the calendar year 1952 announces a final dividend of 4½ per cent, making, with the interim of 3 per cent, a total distribution for the year of 7½ per cent compared with 9 per cent in 1951.

Year to Dec. 31	*Output (tons)*	*Working* Profit £*	*Taxation £*	*Net Profit £*	*Dividend %*	*Carry Forward £*
1952	90	9,152	5,350	3,802	7½	2,145†
1951	99	13,699	9,100	4,599	9	1,202

*After charging depreciation. †After crediting £2,842 in respect of taxation provision no longer required.

As the table above clearly shows, production, profits and dividend payments were all down compared with the preceding year. Although current earnings were not sufficient to distribute 7½ per cent, which required a net amount of £4,198, the writing back from the tax credit of £2,842 made this practical as well as leaving the forward balance nearly £1,000 stronger.

The final dividend will be paid on October 29 to all shareholders on the register at September 18. Meeting, London, September 24.

Naraguta Karama Maintains Dividend on Lower Profits

A preliminary profit statement issued by Naraguta Karama Areas covering the company's operations for the calendar year 1952 announces a final dividend of 5½ per cent, making, with the interim of 3½ per cent, a total distribution for the year of 9 per cent—the same as was paid in 1951.

Year to Dec. 31	*Output (tons)*	*Working* Profit £*	*Taxation £*	*Net Profit £*	*Dividend %*	*Carry Forward £*
1952	133¾	11,459	6,100	5,359	9	4,749
1951	168¼	25,240	15,800	9,440	9	5,246†

*After charging depreciation. †After allocating £3,500 to reserve.

As the table above shows, there was a fall in production of approximately 35 tons and this, together with the lower average price received throughout the year compared with 1951 accounted for the lower earnings. The final dividend will be paid on October 22 to all members on the register at September 18. Meeting, London, September 24.

South Bukeru Pays 10 Per Cent

It will be interesting to see the full report and accounts of South Bukeru Areas dealing with the company's operations during 1952. In the preliminary profits statement now published the working profit for the year, after charging depreciation, is given as £2,559 compared with £8,663 in 1951. The output of tin showed only a modest decline which would hardly account for the steep drop in earnings. Nor does it seem possible that the lowered columbite production would account for it as the increase in the price for the metal should at least offset the lowered output. Yet it may well be that the company has not yet received payment for its columbite output—a fact which has been noted in the accounts of some other Nigerian tin and columbite producers in the past.

Year to Dec. 31	*Output tin (tons)*	*Output c'bite (tons)*	*Working* Profit £*	*Taxation £*	*Net Profit £*	*Dividend %*	*Carry Forward £*
1952	53	1¾	2,559	1,150	1,409	10	4,160†
1951	57¾	4	8,663	5,600	3,063	12½	4,049

*After charging depreciation.
†After allocating £1,000 to reserve and after crediting £1,468 in respect of taxation provisions no longer required.

In any event, the net profit was sufficient to meet the total distribution of 10 per cent which required a net amount of £1,357. On the other hand, the allocation of £1,000 to Contingencies and Investments Reserve was only made possible, without drawing on the forward balance, by using the tax credit for this purpose.

The final dividend will be paid on October 15 to all shareholders registered on September 18. Meeting, London, September 24.

Nigerian Electricity Supply Corporation Pays 10 per cent

Power sales of the Nigerian Electricity Supply Corporation for the year ended February 28, 1953, expanded by £42,823 to £274,782 and was the principal revenue item making up total income for the year of £279,865 which compares with the preceding year's gross revenue figure of £235,197. Total outgoings, including provision for depreciation of £45,000 (£35,000), were £136,561 against £115,604, but even after paying out approximately £9,000 more in taxation, the net profit figure showed an advance of £23,711. Shareholders received the same as in the preceding year, paid by way of a 4 per cent interim and a similar final dividend plus a bonus of 2 per cent, the total net distribution requiring £32,700. Plant replacement reserve was allocated a further £20,000, bringing that fund up to £40,000, and the forward balance at the financial year end was left some £16,000 stronger.

Year to Feb. 28	*Power Sales £*	*Operating Cost £*	*Taxation £*	*Net Profit £*	*Dividend %*	*Carry Forward £*
1953	274,782	69,751	76,228	67,076	10	41,905
1952	231,959	61,391	67,529	52,064	10	25,523

The company's finances appear to be in good shape. Total assets figure in the balance sheet at £929,033 (£874,806) of which £297,117 is represented by current assets. Current liabilities amounted to £46,883. Thus net current assets at £250,234 are almost equivalent to 9s. per £1 share on the one class issued capital of £594,545.

Mr. George Hemmant is chairman. Meeting, London, September 15.

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Duties: Advice on methods of beneficiation of low grade ores and on setting up of smelting and refining industries in zinc, tin, antimony and cobalt, and extraction of sulphuric acid from smelting and industrial gases. Setting up of pilot plants. Supervision of any construction work on smelting and refining plants.

4. ECONOMIC GEOLOGIST

Qualifications: University Degree. Familiarity with modern methods of geophysical exploration. Adequate experience of calculation of ore reserves.

Duties: Reconnaissance surveys, exploration and geological mapping. Economic appraisal of mineral resources.

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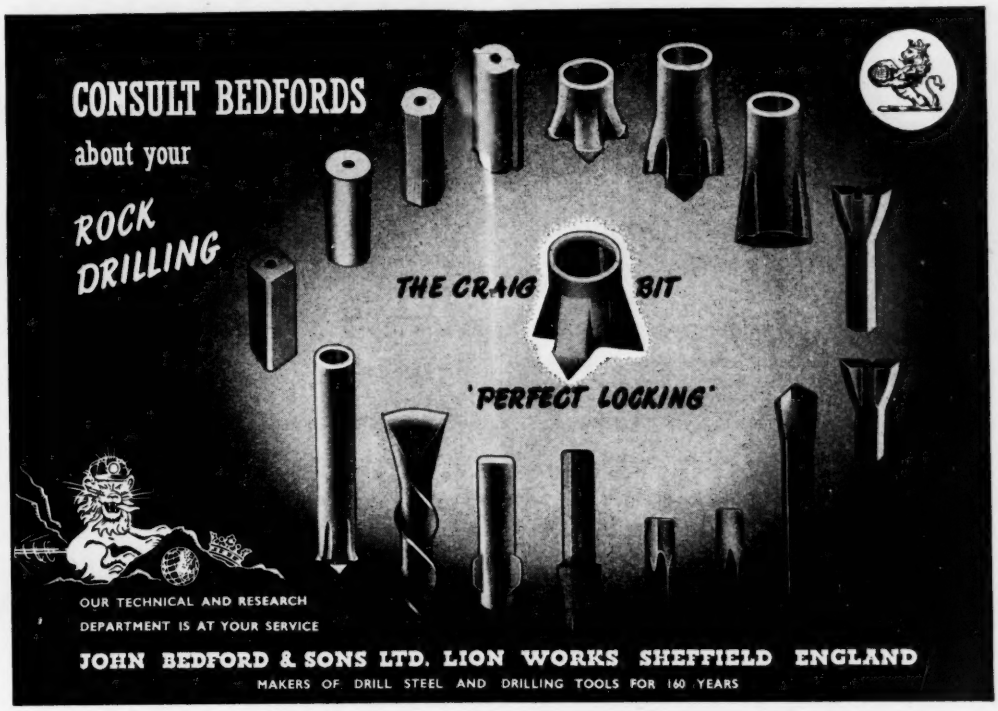

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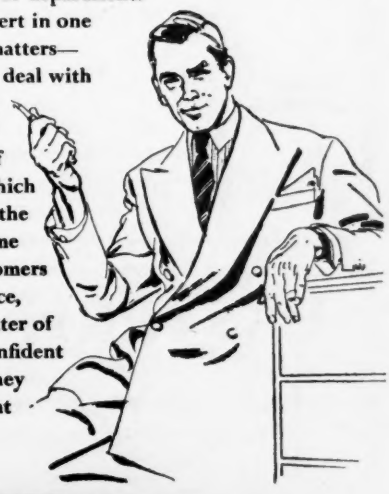

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